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DEPARTMENT OF COMMERCE.

BUREAU OF FISHERIES.

Economic Circular No. 10 : : : : : : : : : : Issued February 27, 1914

MUSSEL RESOURCES IN MISSOURI.[a]

As a part of a general reconnoissance of the mussel-bearing waters of the United States, conducted by the Bureau of Fisheries through the Fairport Biological Station, the streams and lakes of Missouri were examined during the summer of 1913.

Since the Missouri River itself has been known to be practically if not entirely devoid of mussel resources, its tributaries have been generally neglected until the past year or two. Under pressure resulting from the general depletion of mussel beds in streams of wonted fishery, however, the trade has become more and more urgent in the search for new fields of operation. Certain tributaries of the lower portion of the Missouri, and at least one farther up in its basin, the James River of South Dakota, have been found to be sufficiently productive to support a profitable fishery.

The investigation reported in this paper was limited to the State of Missouri, except for an examination of the headwaters of the Osage River in Kansas. At a later time the scientific observations in detail will be reported by Prof. Utterback in connection with data collected by him in course of an investigation of earlier date. The following is a summarized statement of such observations as may be of most immediate interest.

GENERAL CONDITIONS.

Because of the different conditions, associated especially with different physiographic provinces, the mussel life north of the Missouri River is very distinct in kind and quantity from that in the territory south of it. In relation to soils, topography, and geologic conditions, Missouri is naturally divided into four general areas: (1) The prairies, which occupy the territory north of the Missouri River and a triangular section south of it, bounded on the south and east by the divide from the Osage Basin; (2) the Missouri-Mississippi Valleys—that is, the alluvial flood plains lying within the State for both the Mississippi and Missouri Rivers; (3) the Ozarks, which may be divided into three regions, the border, the plateau, and the center, occupying the western, central, and eastern parts of south Missouri,

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[a] Based upon a preliminary report of Prof. W. I. Utterback. During the investigation of the Osage River in June and July, 1913, Mr. Elliott M. Campbell served as assistant.

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respectively; and (4) the Mississippi lowlands, which occupy the extreme projecting southeast corner of the State.

Owing to the muddy and sluggish character of the streams of northern Missouri, the mussels differ, especially in shell characters, from those of the various provinces of the Ozark uplift, where the streams, in marked contrast, are clear and swift.

The Osage Basin, on account of its geographic position and ecologic conditions, possesses a mussel fauna intermediate between those of the northern and southern parts of the State.

THE PRAIRIE DRAINAGE.

The Platte River, the largest of the northwest Missouri streams, has at various times been carefully examined throughout its course; mussel resources are found to be comparatively scant, their greatest occurrence being about midway between the source and the mouth. The mussels are of the mud-loving species, many of which are of commercial value. The river at the present time is practically depleted, but it is thought could be made to yield good returns by propagation. The principal commercial shells are the Wabash pigtoe, three-ridge, washboard, pimple-back, maple-leaf, buckhorn, and yellow sand-shell. The predominant shell of this river, and of all of the northwest Missouri streams, is the paper-shell.

The largest northern tributary to the Missouri in this State is the Grand River, which has a large drainage basin, and extends over the greater portion of the northern section of the State. The river was examined near Darlington, Chillicothe, and Sumner. The mussel fauna is about the same as that of the Platte, but three additional species were noted—the monkey-face, Missouri niggerhead (or hickorynut), and pocketbook. Shells of good quality and in comparative abundance are found from Utica to a few miles below Sumner.

The Chariton River, which lies from 40 to 50 miles east of the Grand, is similar to the last-mentioned in possessing a flood plain of about equal width for its lower half, and in draining nearly the same character of level glaciated territory; but the Chariton is much smaller than the Grand, and its mussel life is less varied. By reason of a drainage ditch designed to straighten its bends, and extending nearly the full length of the river, many of its mussel beds are liable to extinction. Similar dredging has been done along the Nodaway and Tarkio Rivers, where tons of shells are now easily available in the old channels at low water.

As a rule, the commercial shells of the streams of north and northwest Missouri are heavier and less eroded than those found in the swift, clear streams of the southern part of the State.

THE MISSOURI-MISSISSIPPI VALLEYS.

On account of the unstable condition of the bars, with the shifting sand and mud bottoms, together with the excessive turbidity of the water, the Missouri, and that part of the Mississippi between the mouths of the Missouri and the Ohio, are generally unsuited for mussel life. A few mussel beds, composed mostly of slough sand-shells, rock pocketbooks, etc., are found in the sheltered bayous, but none of much economic importance. Lake Contrary and all other cut-off lakes and sloughs, especially of the northwestern part of the Missouri, contain some good quality maple-leaf shells. It is possible that lakes of this type are suited to mussel propagation, since they have a good supply of hard water and abound in the best natural mussel hosts, such as the crappie, bass, and perch.

That part of the Mississippi above the mouth of the Missouri has afforded the best mussel beds of the State, but extensive fishing during the last few years has greatly reduced the output. The principal button shells found in this stretch of the river are the niggerhead,[a] yellow sand-shell, and pimple-back.

THE OZARK DRAINAGE.

The main river basins south of the Missouri are being extensively worked for their shells and incidentally for their pearls. The pearling industry, however, is carried on more particularly in the extreme southern rivers, where shelling has been scarcely profitable because of remoteness from the markets.

The Osage River has been commanding commercial attention for the last year or two. Because of this fact and because it is the largest tributary of the Missouri in the State, the party made an investigation of the river from its headwaters at Ottawa, Kans., to Bagnell, Mo., a distance of more than 300 miles. Since the river lies partly within the Old Prairie Plains and partly within the Ozark border, the mussel faunas of the two general regions are perceptibly fused.

Among the best portions of the river the following may be mentioned: The Marais des Cygnes River, from La Cygne, Kans., where a cutting plant is located, is worked profitably for button shells all the way to the junction of this river with the Marmiton, to form the Osage proper; from this junction to Warsaw is the metropolis of economic shells, especially at Colleys Ford, Schell City, and Osceola. From these points many carloads of good marketable shells have been shipped to button factories within the last two years. These shells consist chiefly of the three-ridge, washboard, lady-finger, mucket, butterfly, buckhorn, pimple-back, and pigtoe. The mussel fishermen report a less return from pearl finds in this river than in the streams south of the Osage Basin.

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[a] It may be stated that the niggerheads have not been found in any Missouri stream except the Mississippi. The so-called Missouri niggerhead, or hickorynut, is a different species.

The Gasconade River is reported to furnish more pearls than the Osage; the commercial shells, such as the muckets and pigtoes, are of better quality, but at no point are the resources equal in quantity to those of the Osage. It is stated that some shells for the pearl-button market have been collected along the course of this river and shipped from Gasconade, on the Missouri Pacific Railroad, and Jerome, on the Santa Fe Railroad. This river was examined at Gascondy, the crossing of the Rock Island Railway, where the stream was found to be clearer, swifter than the Osage, and more narrow and rocky, but with similar characteristic banks of limestone bluffs scattered here and there at rather long intervals. Despite the efforts of game wardens, this and other most accessible rivers of the State are being depleted of fish, most of which are agents for the distribution of mussels during their parasitic life.

The White River of the rugged southern slope in south Missouri is famous for the production of valuable button shells and of pearls, especially along its lower course in Arkansas. In its course through Missouri, this river has carved steep and terraced banks in most places through limestone; hence the water being hardened and the stream bed being of rock overlaid with enough mud brought down from its "bench land," good natural conditions are given for mussel growth and there is a great variety of mussels, many of which are valuable. The principal shells in Missouri are the three-ridge, buckhorn, black sand-shell, and mucket. Three miles above Forsyth a 50-foot power dam has been constructed, and unless suitable fishways be provided it may prove a barrier against the distribution of some species of mussels. The White River has been one of the most profitable streams in the United States for the production of pearls. In this State more attention has been given to pearling than to the shelling phase of the industry. Some fishermen have attempted to market the shells, but so many inconveniences are encountered in transporting the shells to a shipping point that no profit has been realized. However, after this rough hill country is better developed, the facilities for marketing may be improved.[a]

A collection of shells made at Williamsville, Mo. (September, 1913), 40 or 50 miles from the Arkansas State line, gave about the following percentages: Commercial shells 32 per cent, and noncommercial shells 68 per cent. The commercial shells consist of muckets, black sand-shells, and round pigtoes. Twenty-three per cent of the shells were pocketbooks, which were not included as commercial shells, although they are frequently used; 15 per cent were pink pimple-backs, which can be used, but are not desirable on account of the color. If these two species were regarded as commercial, there would be 70 per cent of marketable shells against only 30 per cent to be discarded.

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[a] For detailed reference to a tributary of the White River, see "The Mussels of the Big Buffalo Fork of White River, Arkansas," by S. E. Meek and H. Walton Clark, Bureau of Fisheries Document No. 759.

The beautiful Meramec River drains the northern part of the Ozark center and empties into the Mississippi about 25 miles below St. Louis. Although the mussel beds of this river are being exhausted, it could be restocked by propagation, since it offers favorable conditions as regards stream bed, water supply, plankton, and limestone. Niggerheads and other good shells, in paying quantities, have been shipped from its largest tributary, the Bourbeuse. The mussels of this river in kind and quality are more like those of the southeastern streams than those of the Missouri tributaries.

The upper St. Francis River is the largest of the Ozark center, and also drains most of the Mississippi lowlands. The part of the river which forms the western boundary of the southeast "toe" of the State is very wide and broken into many channels through the swamp district, where the Mississippi flowed before the famous stream capture was made by the Ohio. A mussel bed 2 miles in length near Greenville contains an abundance of shells, but the heavier ones, such as the three-ridge, mucket, etc., are badly eroded.

The Black River and its longest tributary, the Current, complete the drainage of the southern slope of the Ozark center. Since the drainage basins of the Black and upper St. Francis lie so near to each other and are tributaries of the Mississippi, their fish and mussels are almost identical. The shells of this basin are more uniform in size and weight than those of the neighboring Ozark streams. There is, too, less variation in color of nacre. Such shells as the black-sand, lady-finger, and round pigtoe in this river are generally white in color and thus make passable button shells. The predominant mussel in the Black River in Missouri is the pocketbook, averaging about 23 per cent.

After passing into Arkansas the Black River becomes the seat of one of the most important shell fisheries now existing, where it yields niggerhead shells of very fine quality; muckets are less numerous, but are of unusually good quality.

THE MISSISSIPPI LOWLANDS DRAINAGE.

The great swamp lands of southeast Missouri are drained by the St. Francis, Little, and Castor Rivers, whose feeble currents in these level lowlands are inadequate for successful drainage; thus there are numerous wide channels with countless sloughs and bayous. Such conditions are, on the whole, unfavorable to the growth of thick-shelled mussels. Some mussels of economic importance are found along the middle course of the St. Francis, but the best shells are found along its lower stretches in Arkansas. The upper waters of the Castor and Little Rivers have identical mussel faunas with that of the upper St. Francis; but in their lower courses the unstable bottoms present conditions unfavorable for mussel life, as do the lower portions of some of the tributaries of the Missouri River. This investigation did not comprehend a study of the St. Francis River in Arkansas, but it may be mentioned that in its lower courses the river supports rich beds of niggerheads of unsurpassed quality, with some yellow sand-shells and other species. The beds are now greatly depleted.

SCIENTIFIC NAMES OF MUSSEL SPECIES.

For the benefit of those who may wish to use the data herein given for scientific purposes, there is added a list of the scientific names corresponding to the common names as used in this report. For convenience only, the nomenclature of Simpson is followed, although many of the recent changes of Ortman and others will doubtless prove well founded.

1.	Niggerhead	*Quadrula ebena.*	
2.	Pigtoe	*trigona.*	
3.	Wabash pigtoe	*rubiginosa.*	
4.	Pimple-back	*pustulosa.*	
5.	Maple-leaf	*lachrymosa.*	
6.	Monkey-face	*metanevra.*	
7.	Washboard	*heros.*	
8.	Blue-point	*undulata.*	
9.	Three-ridge	*plicata.*	
10.	Round pigtoe (flat niggerhead)	*coccinea.*	
11.	Lady-finger	*Unio gibbosus.*	= Case knife
12.	Buckhorn	*Tritogonia tuberculata.*	= pistol grip
13.	Butterfly	*Plagiola securis.*	
14.	Missouri niggerhead	*Obovaria ellipsis.*	
15.	Paper-shell	*Lampsilis gracilis.*	= rainbow spectacle case
16.	Black sand-shell	*recta.*	= ~~pocketbook~~
17.	Yellow sand-shell	*anodontoides.*	
18.	Mucket	*ligamentina.*	
19.	Pocketbook	*ventricosa.*	= grandmother

complanata, butterfly
A. A. Hinkley

Cucumber = U. cylindricus
biscuit mucket = orbiculata

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DESCRIPTIONS OF NEW SPECIES OF MOLLUSCA FROM THE NORTH PACIFIC OCEAN IN THE COLLECTION OF THE UNITED STATES NATIONAL MUSEUM

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BY

WILLIAM HEALEY DALL

Honorary Curator of Mollusks, United States National Museum

No. 2295.—From the Proceedings of the United States National Museum
Vol. 56, pages 293–371

Washington
Government Printing Office
1919

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INTRODUCTION.

In preparing a census of the shell-bearing Marine Mollusca of the west coast of North America from the Arctic Sea to San Diego, California, with the view of compiling a classified checklist of these animals, it became necessary to review the entire fauna of the west coast of both Americas, as it proved that the range of many species is far greater than had hitherto been assumed. The National Collection is probably the richest in the world for the region indicated, including the dredgings of the United States Bureau of Fisheries steamer *Albatross,* as well as the contributions of a multitude of collectors during nearly half a century. The presence of the types of species described by Gould, Carpenter, and Stearns among the earlier collectors has facilitated the accurate determination of many more or less obscure forms. Among the species examined, especially those from warmer waters and from depths not reached by private collectors, there were found many which seemed to be undescribed.

In order to avoid the publication in the checklist of manuscript names or the omission of species needed for completeness, it has seemed best to prepare diagnoses of such forms as appear clearly new. This has already been done in another publication for the group of Chitons and for the family of Turritidae (formerly known as the Pleurotomidae) and the latter difficult group fully illustrated. It is hoped that the other unfigured species may be illustrated later, but under present conditions the best that could be done was the preparation of full and exact diagnoses and measurements. The types of these new species are, with hardly an exception, preserved in the National Collection.

A thorough and exhaustive collection of the mollusca of the Panamic fauna is still a desideratum and can hardly fail, when made, to enormously increase the number of species known, especially among the minute forms. There are particular areas like the Gulf of Dulce in Central America and the St. Elena region on the northwestern coast of South America which promise rich returns to the explorer. From the latter region Cuming many years ago obtained material which kept the British naturalists, Broderip, Sowerby, and Reeve busy for a score of years describing and illustrating his harvest of new forms. And yet Cuming seems to have collected very few of the smaller species.

From California northward more exhaustive work has been done, though there are notable gaps, many miles in extent, where dredging has never been attempted and shore collections are practically unknown. The character of the coast does not, in such regions, lend itself to easy investigation. Nevertheless we may consider the general fauna as fairly well known, though still affording the prospect of many novelties.

If we regard that region where a given genus is represented by the greatest number of specific forms as being probably the center of origin for species of that group, the conclusion is quite obvious that the Oregonian fauna taken in its widest sense is the parental source of the greater part of the boreal mollusks of the world. On the other hand, if the meager fauna of the boreal Atlantic be taken as the focus of origin, the reverse would be true, and the differentiation of specific forms be greatest at the most distant area of migration, other things being equal.

The Tertiary faunas present much the same problem when analyzed, but in some instances suggest the possibility of reciprocal migration; particular types appearing later in America than in Europe, and the opposite. There can be no doubt, however, that migration of species in the boreal region between the two hemispheres was more easy and the routes more open in the Pliocene and late Miocene than at any subsequent period. In the tropical region, however, the reverse appears to be true, intercommunication between the two oceans having been finally interrupted at the end of the Oligocene period. In my report on the collections of the *Albatross* in the Panamic region I have called attention to the remarkable differences which have resulted from this cause in the composition of the Caribbean and Panamic mollusk faunas.

The explorations of the *Albatross* in the Okhotsk Sea and on the coasts of northern Japan and eastern Siberia, taken with those of the Canadian Arctic Expedition and others on the American side, have cleared up many obscurities in our conception of the geographical distribution of boreal mollusks. We know now that the Asiatic fauna, even near Bering Strait, notwithstanding its geographical approximation is measurably distinct from that of the American coasts, and that the latter on the Arctic shores extends without Greenlandic admixtures far to the eastward of the Mackenzie River delta. Of course there is the expected admixture of characteristically polar forms at the west and a few species of the Oregonian fauna reach both coasts of the Pacific, but only sufficient to contrast with the body of the Asiatic fauna.

In the present paper the locality of the type specimen under description and the number of the type in the Museum Register is given; the entire range covered by the species as far as now known will appear in the Checklist when issued. The manuscript of the latter is ready for the printer and together with the already published Checklist of the bivalves will cover all the marine mollusca of the region specified except the Nudibranchs and Cephalopods which are referred to specialists.

The number of new forms described in the present paper is 222, of which 26 are from the region of the Gulf of California, 4 from the Panamic region, 9 from the Galapagos Islands, 18 from Japan and the adjacent Asiatic coast, and the remainder from San Diego, northward on the American coast to the Arctic Sea. Only the latter group will be included in the checklist, the others being extralimital.

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DESCRIPTIONS OF THE SPECIES.

ACTEOCINA SMIRNA, new species.

Shell minute, white, with yellowish periostracum, of about four whorls with a very minute subglobular hardly projecting glossy nucleus; summit of spire with the whorl but little raised, flattish but not excavated between the suture and the bluntly rounded shoulder; shell in front of the shoulder subcylindric, with fine axial incremental lines; aperture narrow, outer lip thin, nearly straight, rounding in front into the rather wide, slightly excavated pillar which near the body carries a single strong plait; body with a thin coat of enamel, the umbilical region slightly impressed but imperforate; length, 4; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 271492.

Type-locality.—San Diego, California, C. R. Orcutt. The range of this species extends southward to San Salvador.

ACTEOCINA MAGDALENENSIS, new species.

Shell small, slender, subcylindric, translucent white, polished, with four whorls, the nucleus minute, subglobular, transparent; suture distinct, more or less channeled, spire short but distinctly turrited aperture narrow, outer lip straight, rounding below into the thickened pillar which has a strong plait with a groove behind it, the body with a slight glaze; length, 6.7; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 218410.

Type-locality.—Magdalena Bay, Lower California, collected by C. R. Orcutt.

RETUSA XYSTRUM, new species.

Shell minute, white, subcylindric, the aperture as long as the shell, the whorls involved, with a deep pit at the apex, slightly wider in front; very little constricted around the middle; sculpture of extremely fine close longitudinal grooves covering the whole surface; the base produced, imperforate; the aperture very narrow, outer lip straight, as long as the shell, simple, sharp, rounding into the base; length of the shell, 3; maximum diameter, 1 mm. U. S. Nat. Mus. Cat. No. 273985.

Type-locality.—Dredged at San Diego, California, by C. R. Orcutt. Also found at San Pedro.

RETUSA PAZIANA, new species.

Shell minute, white, with an involved spire, above which is a rather large perforation; the general form is subcylindric, wider anteriorly, obscurely widely constricted about the middle of the shell, rounded at the summit, the aperture as long as the shell; sculpture wholly axial, of fine, sharp, close vertical grooving extending over the whole shell, with no perceptible spiral sculpture; aperture very narrow except at the base, rising somewhat above the summit of the shell; base rounded, pillar simple with no chink behind it; height, 3; maximum diameter, 1.4 mm. U. S. Nat. Mus. Cat. No. 211418.

Type-locality.—U. S. Fish Commission station 2823, off La Paz, Gulf of California, in 26 fathoms broken shell.

RETUSA GALAPAGANA, new species.

Shell minute, white, involved, with a deep pit at the apex, the aperture as long as the shell; form subcylindric, the diameter slightly larger anteriorly, the middle of the whorl feebly constricted, the whorl at the summit rounded; the entire shell axially closely sharply grooved; outer lip thin, sharp, aperture very narrow behind the base, pillar simple, rounding into the basal lip; height of shell, 3; maximum diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 194976*b*.

Type-locality.—U. S. Fish Commission station 2813, at the Galapagos Islands, in 40 fathoms, coral sand; temperature at surface, 81° F.

VOLVULELLA COOPERI, new species.

Shell subcylindric, white, in the young with a very short spine, the adult having the spine obsolete or even absent, involved, bluntly rounded at each extremity, the aperture as long as the shell; surface entirely smooth; aperture parallel with the body, very narrow, body with no perceptible enamel, pillar very short, thickened, slightly reflected with a minute chink behind it; length of shell, 9.5; diameter, 3.6 mm. U. S. Nat. Mus. Cat. No. 105501.

Type-locality.—Scammon Lagoon, Lower California, collected by Henry Hemphill. Its range extends north to San Pedro, California.

This is larger, smoother, and less distinctly spinose in the adult than any other west coast species.

VOLVULELLA CALIFORNICA, new species.

Shell minute, polished, white, elongate-ovate, involved, with a short apical spine; axial sculpture of very faint incremental lines; spiral sculpture of microscopic striae near the anterior end; axis imperforate; aperture as long as the shell, outer lip reaching to the end of the spine, from which it is separated by a narrow groove, laterally straight, anteriorly rounding to the slightly thickened pillar; body with a coat of enamel which extends to the pillar and the spine; length, 4; diameter, 1.7 mm. U. S. Nat. Mus. Cat. No. 211303.

Type-locality.—U. S. Fish Commission station 2902, off Santa Rosa Island, California, in 53 fathoms sandy mud; the bottom temperature, 45° F.

VOLVULELLA PANAMICA, new species.

Shell small, involved, ivory white, smooth except for very faint incremental lines, apex with a small short sharp spine extending beyond the edge of the outer lip; form subcylindric, aperture very narrow with a deep apical sulcus, base rounded, pillar very short with a slight twist; length of shell, 4.25; diameter, 1.75 mm. U. S. Nat. Mus. Cat. No. 212654.

Type-locality.—Panama Bay at station 2799, in 29½ fathoms, U. S. Fish Commission.

VOLVULELLA CATHARIA, new species.

Shell small, plump, ovate, ivory white, involved, with a hardly perceptible point at the apex; surface polished; aperture almost or quite equal in length to the shell, narrow, wider in front, the outer lip nearly straight laterally; near the apex and at the pillar the enamel on the body is slightly reflected with a free edge; there are a few hardly perceptible spiral striae, with wider interspaces, near the anterior end; the shell, for so small a species, is relatively thick; length of shell, 2.75; diameter, 1.8 mm. U. S. Nat. Mus. Cat. No. 211784.

Type-locality.—U. S. Fish Commission station 2794, in Panama Bay, in 62 fathoms, sand; bottom temperature, 60° F.

VOLVULELLA CALLICERA, new species.

Shell minute, involved, white, with a short spine at the apex, subcylindrical, almost equally attenuated at both ends, smooth and polished, the outer lip slightly falling short of the end of the spine, laterally straight, rounding gently into the pillar lip in front; aperture not quite as long as the shell, the body polished, a slight thickening on the pillar lip; length, 3.5; diameter, 1 mm. U. S. Nat. Mus. Cat. No. 194976*b*.

Type-locality.—U. S. Fish Commission station 2813, off the Galapagos Islands, in 40 fathoms, coral sand.

SCAPHANDER WILLETTI, new species.

Shell small, yellowish white, of about four whorls, the apex sunken but exposed in a pit bounded by a sharp carina, the shell wider anteriorly; surface with faint incremental lines crossed obliquely by minute vermicular sculpture, which is more nearly spiral about the middle of the shell and visible only under a lens; aperture narrow behind, wider and produced in front, the edge of the outer lip produced to form the apical carina, laterally straight and rounded to the pillar in front; umbilical region covered with a smooth layer of enamel, pillar concave, axis twisted; height of shell, 12.5; maximum diameter, 7; diameter at apex, 2 mm. U. S. Nat. Mus. Cat. No. 216405.

Type-locality.—Forrester Island, Alaska; George Willett.

DIAPHANA BRUNNEA, new species.

Shell small, reddish brown, thin, with a small subglobular nucleus and about three whorls, separated on the flattish summit by a rather deep suture; the last whorl rather large, swollen, widest in front; surface smooth; aperture not quite as long as the shell, narrow behind, expanded in front; outer lip thin, nearly straight, rounding into the pillar lip which is reflected over but does not close a narrow umbilical chink; inner lip thinly glazed, the axis not gyrate; height of shell, 5; diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 208718.

Type-locality.—Harbor of St. Paul, Kodiak, Alaska; in 15 to 20 fathoms, gravelly bottom. Collected by W. H. Dall.

DIAPHANA CALIFORNICA, new species.

Shell translucent and whitish, thin, the brown soft parts showing through, subcylindric, the nucleus minute, globular, with about three subsequent whorls; the spire blunt with the whorls rounded narrowly above a deep suture; surface smooth except for faint incremental lines, polished; aperture as long as the shell, posterior sulcus small, outer lip thin, sharp, straight, axis imperforate, pillar lip thin, body hardly glazed; height, 4.5; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 130561.

Type-locality.—Long Beach, California; collected by Miss Shepard, now Mrs. Oldroyd.

CYLICHNELLA (BULLINELLA) DIEGENSIS, new species.

Shell small, thin, cylindric, white, with a pale straw-colored periostracum with reddish brown spiral lines on the base and near the apex; whorls involved, the apex exhibiting a funicular depression ending in a minute perforation; the surface smooth and polished except for faint incremental lines; aperture very narrow, the outer lip thin, straight, recurving deeply around the apex, at the base receding and rounding into the simple, thickened pillar lip; body with a slight glaze; length of shell, 8; diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 209071.

Type-locality.—U. S. Fish Commission station 4359, off Point Loma, San Diego County, California, in 98 to 191 fathoms, muddy bottom.

BULLARIA QUOYANA, new name.

This is *Bulla quoyi* A. Adams, 1850, but not of Gray, 1843. The species ranges from Catalina Island, California, to Acapulco, Mexico.

HAMINOEA OLGAE, new species.

Shell large, thin, very light yellowish green or reddish brown, inflated, with the outer lip rising high above the sunken and impervious spire; the apical depression not carinate, the axis gyrate and widely pervious; outer lip arcuate, thin, sharp, rounding into the pillar below; axial sculpture confined to low narrow irregular wrinkles, stronger distally; spiral sculpture of minute, close-set, slightly wavy striae over the whole surface; the inner lip with a thin coating of whitish enamel; height of shell, 27; diameter, 16 mm. U. S. Nat. Mus. Cat. No. 216812.

Type-locality.—Sandspit, Peavine Pass, Olga, Washington, collected by C. C. Engberg. The species ranges to Lower California, at San Quentin Bay.

The nearest relative of this species is *H. vesicula* Gould, which is uniformly smaller, paler, with a shorter body and wider axial gyration.

PHILINE BAKERI, new species.

Shell minute, translucent, of two or more whorls, enfolded, except the subglobular nucleus by the last whorl; apex blunt; last whorl narrow, obliquely expanded in front; sculpture of numerous fine incised punctate spiral lines with wider interspaces; axis gyrate, pervious; aperture as long as the shell, narrow behind with a very slight sulcus, but widely expanded in front; outer lip thin, sharp, straight, inner lip hardly glazed; height, 2; diameter, 1.25 mm. U. S. Nat. Mus. Cat. No. 225194.

Type-locality.—Off the South Coronado Island in 3 to 6 fathoms; collected by Dr. Fred Baker.

PHILINE HEMPHILLI, new species.

Shell small, greenish-white, thin, of about three whorls, the last enveloping the others, the axis gyrate, widely pervious; apex depressed, not perforate, bluntly rounded; aperture as long as the shell; surface smooth, except for a few microscopic spirals near the summit and faint incremental lines; outer lip thin, a deep sulcus between it and the spire; the middle part of the lip much produced, the anterior part receding and curving roundly into the thin pillar lip, the body hardly glazed; height, 5; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 211753.

Type-locality.—U. S. Fish Commission station 2936, off Cape San Quentin, Lower California, in 359 fathoms; bottom temperature, 49° F.

CRYPTOGEMMA EIDOLA, new species.

Shell small, white, covered with an olivaceous periostracum, and with four whorls exclusive of an apical whorl or two (which in the specimens is always eroded), suture distinct, the edge of the whorl in front of it slightly thickened; spiral sculpture on the upper whorls of a somewhat blunt peripheral keel, undulated more or less toward the apex and obsolete on the last whorl; other sculpture of minute, broken, irregular, more or less oblique, usually punctate impressed lines; aperture simple, the outer lip sharp, the body erased, white, the canal short, somewhat recurved; height of four whorls, 15; of last whorl, 10; diameter, 7 mm. U. S. Nat. Mus. Cat. No. 212336*a*.

Type-locality.—Off San Diego, California, in 822 fathoms, mud; U. S. Fish Commission.

CRYPTOGEMMA OREGONENSIS, new species.

Shell small, white, with a pale olivaceous periostracum, and more than four whorls, the apex always eroded, the suture distinct, the whorl in front of the suture as far as the shoulder flattish; shoulder of the whorl strongly marked, angular, coronated by the ends of (on the penultimate whorl about 25) straight, protractively oblique narrow ribs with subequal interspaces, becoming obsolete on the base of the last whorl; incremental lines more or less distinct but not regular; spiral sculpture of one or two feeble impressed lines on the whorl above the shoulder, and three or four widely spaced threads on the base, though the region of the canal is free from spiral sculpture; aperture narrow, anal sulcus wide and shallow, outer lip produced, thin, body and pillar erased, canal rather short, axis pervious; height of four whorls 11; of last whorl, 7; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 214243.

Type-locality.—U. S. Fish Commission station 3346, off Tillamook Bay, Oregon, in 786 fathoms, ooze; bottom temperature, 37.3° F.

BORSONELLA CIVITELLA, new species.

Shell fusiform, elongate, acute, of a pale buff color, of eight or more whorls, the nucleus defective, the suture distinct, not appressed; axial sculpture of (on the penultimate whorl, 9) short prominent ribs conspicuous only on the periphery and obsolete on the later part of the last whorl, the incremental lines are also rather conspicuous; there is no spiral sculpture except a few faint lines on the anal fasciole which is adjacent to the suture; in addition to the above there are minute oblique striae often punctate, with wider interspaces which cross the incremental lines almost at right angles; these, hardly visible except under a lens, give the surface a vermiculate aspect; aperture rather narrow, the anal sulcus wide and shallow, the outer lip strongly protractively arcuate, thin, simple; inner lip with a thin wash of callus, pillar straight with a single plait, throat yellowish, canal wide, straight; height of shell, 19; of last whorl, 11.5; of aperture, 8; diameter, 6.5 mm. U. S. Nat. Mus. Cat. No. 209034.

Type-locality.—U. S. Fish Commission station 4310, off Point Loma, California, in 71 to 75 fathoms sandy mud.

The plait on the pillar is invisible from the aperture.

LORA FIORA, new species.

Shell small, grayish white, acute, with a small subglobular nucleus and six subsequent whorls moderately rounded and with a slight shoulder; suture distinct, not appressed; spiral sculpture of (on the penultimate whorl in front of the shoulder about 6) incised lines, with wider interspaces, overrunning the ribs; on the last whorl this sculpture extends to the canal; axial sculpture of (on the last whorl about 17) short rounded ribs extending from the shoulder, where they are most prominent, over the periphery and obsolete on the base; there are also fairly distinct incremental lines; aperture short, wide, with a feeble anal sulcus and hardly differentiated canal; outer lip thin, simple, inner lip erased; throat whitish; height of shell, 9.75; of last whorl, 6; of aperture, 4; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 220399*a*.

Type-locality.—Adakh Island, Aleutians, in 15 fathoms, mud and sand; collected by W. H. Dall.

LORA CASENTINA, new species.

Shell small, white, with about five whorls, the nucleus decorticated, the whorls with a subangular shoulder in front of the anal fasciole; axial sculpture of (on the penultimate whorl about 20) low, thread-like ribs extending from the shoulder to the succeeding suture, but more or less obsolete on the last whorl; spiral sculpture of faint feeble striae on the fasciole, in front of the shoulder of numerous close-set flattish small threads, extending uniformly to the canal; anal sulcus shallow; outer lip slightly arcuate, inner lip erased; pillar short, straight; canal hardly differentiated; height of shell, 9; of last whorl, 7; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 209257.

Type-locality.—U. S. Fish Commission station 4538, off Point Pinos Light, Monterey Bay, California, in 795 to 871 fathoms, sand.

LORA GALGANA, new species.

Shell white, under a yellowish periostracum, of six or more obtusely shouldered whorls, the apex decorticated, the suture appressed; axial sculpture on the earlier whorls of about 18 protractively oblique rounded ribs, slightly angulate at the shoulder, feeble on the fasciole and crossing the whorls except on the last whorl where they gradually become obsolete; the whole surface is spirally sculptured with fine close-set threads, here and there one a little more prominent than the rest, others near the canal coarser; anal sulcus wide and shallow; outer lip arcuate, inner lip erased; canal moderately long, slightly recurved; height of shell, 15; of last whorl, 11; diameter, 6 mm. U. S. Nat. Mus. Cat. No. 214173.

Type-locality.—U. S. Fish Commission station 3330, Bering Sea, north of Unalaska in 351 fathoms, sand.

LORA AMIATA, new species.

Shell elevated, rugose, white under a pale yellow periostracum, with six subtabulate whorls, the nucleus decorticated, suture obscure, closely appressed; spiral sculpture of an angle at the shoulder, between which and the suture are four or five close-set small equal threads; in front of the shoulder is a constriction beyond which are about a dozen deep grooves with wider rounded interspaces which are finely spirally striated; on the canal there are crowded small threads; axial sculpture of about 15 short ribs extending from the shoulder, which they nodulate, to the periphery only; aperture narrow with a shallow anal sulcus; outer lip thin, inner lip erased, canal straight and short; height of shell, 15; of last whorl, 10.5; of aperture, 8; diameter, 7 mm. U. S. Nat. Mus. Cat. No. 214219.

Type-locality.—Off Belkoffski, Alaska, in 15 to 75 fathoms, shelly bottom; collected by W. H. Dall.

LORA RASSINA, new species.

Shell small, white, with a small (decorticated) nuclear whorl and five subsequent slightly shouldered whorls; suture distinct, not appressed; axial sculpture of (on the last whorl about 20) narrow rounded ribs extending from the suture over the periphery but more or less obsolete on the base; the interspaces wider; spiral sculpture of numerous close-set rounded threads over the whole surface but not nodulating the ribs; anal sulcus very shallow, outer lip thin, nearly straight, inner lip erased, canal very short, hardly differentiated from the aperture; height of shell, 10; of last whorl, 7; diameter, 5.5 mm. U. S. Nat. Mus. Cat. No. 214224.

Type-locality.—U. S. Fish Commission station 3305, in Bering Sea, southwest of Hagmeister Island in 23 fathoms, mud; bottom temperature, 41.8° F.

PHILBERTIA CAPANIOLA, new species.

Shell small, strongly sculptured, yellowish white, elevated, with about six whorls, including the smooth minute nucleus of about one whorl; suture distinct, rather deep, whorls well rounded; axial sculpture of (on the last whorl 11, omitting the final varix) narrow rounded ribs with a slight shoulder, extending to the canal, with wider interspaces, both crossed by the spirals but without nodulation; spiral sculpture of (on the spire in front of the shoulder about 4) well-defined cords with narrower interspaces, which become more or less obsolete on the last whorl; aperture narrow, the anal sulcus shallow, and producing no very marked fasciole; outer lip infolded, thick, with a varical swelling behind it, simple within; body erased, pillar short, straight; canal hardly differentiated; height of shell, 6.5; of last whorl, 4; of aperture, 3.5; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 150992*a*.

Type-locality.—Near San Diego, southeast of Point Loma, in 12 to 15 fathoms; collected by Dr. Fred Baker.

MANGILIA (KURTZIELLA) ALESIDOTA, new species.

Shell small, yellowish, with on the last whorl a faint dark band in front of the suture and an obscure dark line at the periphery, with a dark flush on the canal; with six whorls, including a minute smooth nucleus followed by a minutely reticulated second whorl, and then by the adult sculpture; suture distinct, slightly appressed, the anal fasciole occupying the space between it and an angular shoulder; axial sculpture of (on the penultimate whorl, 15) narrow, sharp, arcuate ribs extending from the suture over the periphery, with wider interspaces; there are also minute incremental lines roughening the spirals; spiral sculpture of numerous minutely channeled grooves with wider flattish interspaces (the latter sometimes with a smaller median groove) covering the whole surface; aperture narrow, with a wide very shallow anal sulcus; outer lip thin, sharp, body erased, pillar straight, axis pervious, gyrate; canal hardly differentiated;

height of shell, 7.5; of last whorl, 5.2; of aperture, 3.5; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 56913.

Type-locality.—Catalina Island, California; W. H. Dall.

MANGILIA (KURTZIELLA) TERSA, new species.

Shell small, thin, slender, acute, yellowish with a narrow peripheral brown band, which on the spire lies just behind the suture; with seven and a half whorls, including the polished nucleus, which begins with a small coil then becomes more inflated and finally presents a peripheral keel before the normal adult sculpture begins; axial sculpture of (on the last whorl about 13) narrow rounded ribs with much wider interspaces, extending over the base on the last whorl and most prominent at the periphery on the spire; there are also fine incremental lines which in unworn specimens make the sculpture minutely imbricated; suture distinct, appressed, and more or less undulated by the ribs; anal fasciole wide, constricted, forming a slight shoulder to the whorl in front of it; spiral sculpture of fine close scabrous revolving threads over the whole surface; aperture narrow, outer lip thin, simple, with a wide shallow anal sulcus, the body erased, the pillar straight, attenuated in front, canal short, hardly differentiated; height of shell, 11; of last whorl, 6.5; of aperture, 5; diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 133910.

Type-locality.—San Diego, California; Miss J. M. Cooke.

AGATHOTOMA POMARA, new species.

Shell small, fusiform, solid, with six moderately convex whorls, the nucleus small, subglobular, smooth (slightly decorticated); axial sculpture of (on the penultimate whorl 11, on the last whorl 9) prominent, slightly shouldered ribs with wider interspaces, the ribs undulating the appressed suture; spiral sculpture of close-set alternated threads over the whole surface except between the shoulder and the suture, which is arcuately striated by the incremental lines; aperture narrow, straight, the anal sulcus moderate, the outer lip thickened, simple, the inner lip with a wash of enamel; the canal hardly differentiated; height of shell, 7; of aperture, 4; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 152746.

Type-locality.—San Pedro, California; H. Lowe.

The shell is discolored so the normal color can not be determined.

ZETEKIA CURTA, new species.

Shell, small, short, solid, inflated, of a brownish color, nucleus minute smooth, succeeded by about three subsequent strongly sculptured whorls; suture distinct; axial sculpture of (on the penultimate whorl about 15) narrow, sharp, similar riblets with wider interspaces, this sculpture extending over the base; spiral sculpture of (on the last whorl about 16) even regular similar threads with subequal interspaces which pass over but do not nodulate the ribs; aperture narrow, outer lip thickened, crenulate by the sculpture, not reflected; anal sulcus shallow but conspicuous; pillar lip smooth, the pillar with a layer of enamel with a raised edge, canal short, deep, but hardly differentiated. Height 2.3; diameter 1.5 mm. U. S. Nat. Mus. Cat. No. 214266.

Type-locality.—Panama Bay in 29 fathoms, U. S. Bureau of Fisheries, Station 2799.

Genus CANCELLARIA Lamarck, 1799.

After a careful examination of the literature, including the arrangement by Dr. Jousseaume, I have come to the conclusion that the Californian species of the genus *Cancellaria* in its wider sense can not properly be included in any of the groups into which it has been hitherto divided. I have therefore proposed[1] for them the subgeneric name of *Progabbia* in honor of William M. Gabb, an indefatigable worker in recent and fossil Conchology and one of the earliest paleontologists on the west coast. The type is *Cancellaria cooperi* Gabb, one of the finest and probably the largest species of *Cancellaria* living. The hirsute species like *C. crawfordiana* Dall, may be regarded as forming a section *Crawfordina*.

ADMETE RHYSSA, new species.

Shell small, white, with an olivaceous periostracum, a loosely coiled (decorticated) nucleus, and about four subsequent whorls separated by a distinct suture; axial sculpture of (on the last whorl a dozen) rather narrow, nearly vertical ribs, which extend from suture to suture on the spire and from the suture to the margin of the base in the last whorl, with wider interspaces; incremental lines rather marked; spiral sculpture of (on the spire four, on the last whorl eight) prominent threads with wider interspaces, overriding the ribs and coming to a node when they intersect them; the base nearly smooth except for one or two minor threads near the canal; aperture semilunate, the outer lip thin, body with a thin layer of enamel; pillar with three oblique plaits, canal shallow, short, with a faint fasciole; height of shell, 7; of last whorl, 5; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 211241.

Type-locality.—U. S. Bureau of Fisheries station 4343, off the South Coronado Island, in 155 fathoms, sandy bottom.

MARGINELLA ALBUMINOSA, new species.

Shell large, creamy white, thin for its size, brilliantly polished, with a translucent yellowish depressed nucleus of two whorls and three subsequent whorls; spire low, covered with a thin coating of enamel which partly obscures the sutures; last whorl plump, with a tinge of yellow outside the varix and around the siphonal fasciole; outer lip with a narrow external thickening, internally quite smooth; inner lip with four prominent thin plaits with wider interspaces, counting the elevated edge of the pillar; height of shell, 27; of last whorl, 25; diameter, 17 mm. U. S. Nat. Mus. Cat. No. 101068.

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[1] Proc. Biol. Soc. Wash., vol. 31, p. 138, Nov. 29, 1918.

Type-locality.—West Mexico, received from Prof. Alfred Dugès. This belongs to the group of *M. curta* Sowerby, but is a much thinner and more elegant shell.

MARGINELLA POLITULA (COOPER MS.), new species.

Shell minute, translucent white, of about two and a half whorls, the spire evident but covered with transparent enamel; it is widest posteriorly but does not attenuate rapidly enough to become pyriform; the aperture is nearly as long as the shell, the outer lip thickened, internally smooth, nearly straight; inner lip polished with three oblique plaits; height of shell, 3; maximum diameter, 1.5 mm, U. S. Nat. Mus. Cat. No. 23240.

Type-locality.—Catalina Island, California, in 30 fathoms, collected by J. G. Cooper.

The differences which separate these small Marginellidae are not great but appear to be constant enough to take specific rank. The present species has long been known among collectors by Doctor Cooper's manuscript name, but so far as I have discovered has never been described, although it was collected by Colonel Jewett in 1849.

MARGINELLA EREMUS, new species.

Shell small, white, smooth, solid, with about four whorls, the nucleus, as in most abyssal species of the genus, being subglobular and relatively large; suture appressed, rather obscure, general form of the shell not unlike that of *M. yucatecana* of the West Indies, but more slender and much smaller; outer lip thickened, especially near the posterior commissure, near which is a single denticle on the inner side of the lip; in front of this a few obscure low nodulations; inner lip with four subequal plaits, including that at the edge of the pillar; height of shell, 5; of last whorl, 4; diameter, 2.4 mm. U. S. Nat. Mus. Cat. No. 207622.

Type-locality.—Near the Galapagos Islands, at U. S. Fish Commission station 2808, in 634 fathoms, sand; bottom temperature 39.9° F.

MARGINELLA ANTICLEA, new species.

Shell minute, smooth, evenly spindle shaped, glistening milk white, with about four whorls, including a moderately large blunt nucleus; suture obscured by a thin coat of enamel; aperture narrow, outer lip thin, with no internal denticulations; pillar with four plaits, including the thickened edge, the two posterior plaits larger than the others; general form not unlike that of *eremus*, but more slender; height of shell, 3.5; of last whorl, 2.8; diameter, 1.6 mm. U. S. Nat. Mus. Cat. No. 194986.

Type-locality.—U. S. Fish Commission station 2813, among the Galapagos Islands, in 40 fathoms, coral sand.

HYALINA MYRMECOON, new species.

Shell minute, white, smooth, polished, with about three whorls forming a blunt spire, widest near the posterior commissure of the aperture, attenuated in front, sides moderately convex; suture obscure; aperture narrow, outer lip straight, slightly thickened; body with a wash of enamel, pillar with three plaits; height, 3.3; maximum diameter, 1.6 mm. U. S. Nat. Mus. Cat. No. 9440.

Type-locality.—San Diego, California (Brannan), Stearns Collection.

Genus BOREOMELON Dall, 1918.

Type.—Scaphella stearnsii Dall, 1872.

The fortunate receipt of some ovicapsules of this species shows that the larval specimens have a smooth, shelly nucleus, so that it must be removed from the Caricellinae, to which it has hitherto been referred, and placed under *Fulgoraria* in the Volutinae. In the absence of the nuclear characters the writer formerly placed this species with *Adelomelon*, though with some doubts.

Genus PHENACOPTYGMA Dall, 1918.

Shell fusiform, with transverse and axial sculpture, elongated canal and apparently simple pillar; the axis in the upper whorls with two well-marked plications.

Type.—Surculina cortezi Dall, 1908.

This shell has the appearance of a Pleurotomoid, with the whorl constricted and appressed near the suture and a feeble incurvation of the margin of the lip at the constriction. By grinding away a portion of the apical whorls it was revealed that the axis is furnished with plications which extend to the beginning of the penultimate whorl. It is probably a member of the Volutidae, which family is known to include several genera in which the plaits become obsolete before reaching the aperture, or even, as in *Halia*, completely disappear.

STRIGATELLA (ATRIMITRA) CATALINAE, new species.

Shell solid, black, fusiform, with about seven whorls exclusive of the (lost) nucleus; suture depressed, not deep, the whorls only moderately convex and polished; axial sculpture of extremely fine hardly perceptible incremental lines; spiral sculpture of about four fine inconspicuous minutely punctate incised lines, only strong on the very early whorls, obsolete on the last whorl, with wide interspaces crossed by almost microscopic spiral striae; aperture narrow, the canal hardly differentiated, the enamel very dark, only the plaits whitish, the anterior plait feeble, only distinct in the completely adult shell, the other three conspicuous and strong. Height of shell, 29; of last whorl, 20; of aperture, 15; diameter, 11 mm. U. S. Nat Mus. Cat. No. 219648.

Type-locality.—San Pedro, California, Mrs. Baldridge.

No special name having been applied to the group of black Strigatellas of the Pacific coast, although their similarities are so striking, I have proposed the designation *Atrimitra* (1918).

STRIGATELLA (ATRIMITRA) DIEGENSIS, new species.

Shell small, blackish brown, slender, with a whitish nucleus of about three whorls and four subsequent whorls; the initial part of the nucleus very small and forming a blunt apex, the whole nucleus smooth and changing suddenly to the normal sculpture; the latter begins with four rounded, somewhat undulated strong spiral cords with narrower interspaces; on the next whorl the cords have flattened out and the much narrower interspaces are channeled; on the subsequent whorls the cords become still flatter and wider and the interspaces narrow grooves, occasionally punctate from the intersection of incremental lines otherwise hardly visible; on the last whorl the grooves are obsolete on the middle of the whorl, but there are half a dozen feeble threads on the base and canal; the suture is closely appressed; aperture narrow, simple, outer lip hardly thickened, body erased, pillar with two prominent and one obscure plait; canal not differentiated; height of shell, 14; of last whorl, 11; of aperture, 8 mm.; diameter 5.5 mm. U. S. Nat. Mus. Cat. No. 252998.

Type-locality.—San Diego, California; White Collection.

STRIGATELLA (ATRIMITRA) MEXICANA, new species.

Shell large, solid, originally black, but the type-specimen is now decorticated and has lost its nucleus; spire acute, of more than seven moderately rounded whorls, the apex defective; spiral sculpture on the early whorls of half a dozen feeble flattish cords with narrower interspaces, stronger near the preceding suture, absent on the anterior part of the whorl; these continue but less obviously on the last whorl and similar but stronger cords appear on the base, the peripheral region remaining smooth; the canal hardly differentiated but slightly recurved, forming a well marked fasciole; pillar with three strong plaits about midway of the aperture; length of shell, 72; of last whorl, 48; of aperture, 35; maximum diameter, 24 mm. U. S. Nat. Mus. Cat. No. 274124.

Type-locality.—U. S. Fish Commission station 3011, off Guaymas, Mexico, in 71 fathoms, sand.

VOLUTOPSIUS ROTUNDUS, new species.

Shell large, slender, rather thin, with a distinct almost constricted suture and more than five rounded whorls (the extreme apex defective); white or pinkish with a thin dehiscent pale straw-colored periostracum; axial sculpture on the apical whorls of a few, irregular, low plications, mostly with narrower interspaces; on the rest of the shell only irregular incremental rugosities; spiral sculpture on the last whorl behind the base, of half a dozen obscure low cords with wider interspaces; on the base these cords number about 15, becoming more regular and close anteriorly; the canal is still more finely and closely threaded; aperture elongate, outer lip thin, body and pillar erased; canal short and wide. Height of four whorls, 105; of last whorl, 75; diameter, 40 mm. U. S. Nat. Mus. Cat. No. 206350.

Type-locality.—Kodiak Island, Alaska; Fisher.

This is also rather common in Cook's Inlet, and may prove to be a *Beringius*.

VOLUTOPSIUS FILOSUS, new species.

Shell small, solid, fusiform, of a livid flesh color with grayish white outer coat and dehiscent olivaceous periostracum and about six whorls, the nucleus decorticated; suture distinct, rather deep; sculpture of uniform fine flattish threads, close-set, about two to a millimeter, covering the whole surface, with axial sculpture of fine inconspicuous incremental lines; whorls evenly rounded but not inflated; aperture elongate, the outer lip thickened and slightly reflected; the body and rather straight pillar thickly enameled; canal short and wide, slightly recurved, with a feeble fasciole; the operculum is brown, narrow, parallel-sided, with the nucleus at the right-hand corner. Height of shell, 64; of last whorl, 52; diameter, 30 mm. U. S. Nat. Mus. Cat. No. 223055.

Type-locality.—U. S. Fish Commission station 3283, off the Khudubine Islands, Bering Sea, in 39 fathoms, sand; bottom temperature, 40.3° F.

VOLUTOPSIUS MIDDENDORFFII, new variety EMPHATICUS.

Shell smaller than the average typical *middendorffi*, with the fine spiral striae and threadlike incremental lines emphasized so as to form a fine cloth-like reticulation on the surface. A female specimen measures, height of shell, 92; of last whorl, 70; diameter, 50 mm. U. S. Nat. Mus. Cat. No. 205368.

Type-locality.—U. S. Bureau of Fisheries station 4982, in the Japan Sea, in 390 fathoms, mud; bottom temperature, 32.7° F.

VOLUTOPSIUS DIMINUTUS, new species.

Shell small for the genus, pale flesh color, with six whorls, of which about two (decorticated) belong to a swollen nucleus apically blunt; the spire is rather attenuated, the whorls moderately rounded, the suture narrow and deep; surface in front of the suture smooth halfway to the periphery on the last whorl then spirally sculptured with numerous shallow grooves, with much wider flat interspaces, the grooves almost punctuate by the incremental sculpture which also gives them a more or less minutely irregular course and transversely striates the interspatial surfaces; aperture lunate, the outer lip somewhat expanded and thickened, the body and pillar callous, the canal short and wide, a little recurved; height of shell, 42; of last whorl, 31; diameter, 21 mm. U. S. Nat. Mus. Cat. No. 206829*a*.

Type-locality.—U. S. Bureau of Fisheries station 4844, in the Japan Sea, in 116 fathoms.

BERINGIUS CREBRICOSTATUS, new variety UNDATUS

Specimens (mostly young) differing from the typical form in having about 17 arcuate rounded ribs extending from the constricted suture to the periphery and obsolete on the base; there are also more numerous (about 18) spiral ridges, smaller and of course much closer together than in the case of the typical form. The apex of the largest specimen (about two-thirds grown) is defective, but there are five completed whorls, measuring 78 mm. long and with a diameter of 35 mm. U. S. Nat. Mus. Cat. No. 223031.

Type-locality.—U. S. Bureau of Fisheries station 4224, at Cygnet Inlet, Boca de Quadra, Alaska, in 160 fathoms, mud; bottom temperature, 43.7° F.

BERINGIUS KENNICOTTII, new variety INCISUS.

Shell resembling the typical form but more slender and with the spiral sculpture very sharply emphasized, the striae becoming grooves and the base coarsely threaded. Height of immature shell, 75; of last whorl, 50; diameter, 35 mm. U. S. Nat. Mus. Cat. No. 110488.

Type-locality.—U. S. Bureau of Fisheries station 4779, on Petrel Bank, Bering Sea, in 54 fathoms, gravel.

In a large series of the typical *B. kennicottii* I find the axial ribs varying in number on the last whorl from 9 to 19; the specimens with the more numerous ribs and inflated whorls, being usually females who have to carry the material for the large ovicapsules.

BERINGIUS MARSHALLI, new species.

Shell large and thin, livid flesh color, with a dehiscent, thin, pale brownish periostracum; suture distinct, constricted, the whorl slightly flattened in front of it; spire attenuate with seven whorls exclusive of the (lost) nucleus, the apical whorls feebly irregularly axially plicate, the others with only rather conspicuous silky incremental lines; at the shoulder on the last whorl are developed low oblique, irregular ridges with wider interspaces; a few also appear near the periphery; on the base there are about eight low obscure ridges with wider interspaces; aperture ovate, pinkish brown within, outer lip thin, body and pillar with a thin layer of enamel, the pillar nearly straight, as is the wide short canal; the operculum large, black, with apical nucleus. Height of shell, 144; of last whorl, 100; diameter, 54 mm. U. S. Nat. Mus. Cat. No. 224077.

Type-locality.—U. S. Bureau of Fisheries station 3549, in Bering Sea, off Unalaska, in 78 fathoms, sand; bottom temperature, 40.1° F.

Named in honor of Mr. W. B. Marshall of the National Museum staff and well known as a student of fresh water mollusca.

BERINGIUS INDENTATUS, new species.

Shell large, short-spired, acute, solid, livid whitish, with a thin dehiscent pale brownish periostracum and six shouldered whorls exclusive of the (lost) nucleus; axial sculpture of (on the penultimate whorl, 14) rounded, arcuate ribs, with wider interspaces, most prominent at the shoulder but extending over the periphery almost to the canal, though somewhat irregularly disposed; other axial sculpture of rather conspicuous crowded incremental lines; spiral sculpture none, on and near the periphery of the last whorl are a few more or less obsolete irregularly divergent raised lines; aperture wide, white, throat pinkish, outer lip thin, expanded, body and pillar thickly enameled, pillar straight, canal short, shallow, wide, hardly recurved; operculum dark brown, chrysodomoid, the scar of attachment relatively small. Height of shell, 110; of last whorl, 78; diameter, 58 mm. U. S. Nat. Mus. Cat. No. 213315.

Type-locality.—U. S. Fish Commission station 3282, off the Khudubine Islands, Bering Sea, in 53 fathoms mud; bottom temperature, 38.2° F.

This belongs to the group of *B. kennicottii.*

ANCISTROLEPIS EUCOSMIUS, new variety BICINCTUS.

Shell resembling typical *eucosmius*, but with, on the spire, only two strong spiral ridges, equidistant from the sutures, and on the base three more adjacent, smaller, and diminishing in size and separation toward the canal. The surface is covered with a delicately reticulated, velvety periostracum of a pale olive color over white shelly matter. The operculum is normal. Height, 28; diameter, 17 mm., the apex slightly eroded. U. S. Nat. Mus. Cat. No. 122673.

Type-locality.—U. S. Fish Commission station 3337, southeast of Unalaska, Alaska, in 280 fathoms, mud.

ANCISTROLEPIS CALIFORNICUS, new species.

Shell of moderate size, solid, white, with an olivaceous periostracum, with about seven whorls, excluding the (defective) nucleus, with the sutural channel almost obliterated; apical whorls with two, later whorls with three strong but not sharp carinae, revolving nearly equidistant between the sutures, the posterior carina slightly smaller than the others; on the base are about half a dozen similar carinae beside the small spiral threads on the canal; other spiral sculpture of minute striae and threads pretty uniform over the surface, with an occasional stronger intercalary thread; axial sculpture of faint irregular incremental lines on which the periostracum is sometimes raised; aperture white, internally reflecting the stronger sculpture; outer lip thin, not reflected, body erased, pillar short, strong, sharply twisted, with a short wide canal. Height of shell, 46; of last whorl, 33; diameter, 30 mm. U. S. Nat. Mus. Cat. No. 122667.

Type-locality.—U. S. Fish Commission station 2919, in 984 fathoms, mud, near the Cortez bank off the coast of southern California.

This is a larger and more conic shell than *A. eucosmius* and has fewer keels.

ANCISTROLEPIS BERINGIANUS, new species.

Shell large, solid, livid whitish, with a long acute spire, the apex defective, but the shell had more than six whorls, separated by a very narrow deep suture and covered by a very thin pale olivaceous periostracum; whorls well rounded, with four or five nearly obsolete flattish spiral ridges between the base and the shoulder, with wider interspaces, the base delimited by a stronger cord, in front of which are eight or ten similar flattish spirals more closely set. There is also a very minute scratchy spiral striation; axial sculpture only of rather rude incremental lines; aperture short and wide, the outer lip thin, not expanded, the body erased, the pillar short, white, twisted, the axis not quite pervious, and with a feeble fasciole. Height of five whorls, 98; of last whorl, 66; of aperture and short wide canal, 51; diameter, 52 mm. U. S. Nat. Mus. Cat. No. 205401.

Type-locality.—U. S. Bureau of Fisheries station 4794, in western Bering Sea, off Starichkoff Island, in 58 fathoms, gravel.

ANCISTROLEPIS TROCHOIDEUS Dall.

Shell small, short, wide, white, with about five whorls, the nucleus eroded, white, with a pale olive, minutely laminate periostracum; upper whorls with two later with four angular keels, with smaller intercalary cords, the base with seven strong rounded cords with equal interspaces; axial sculpture of fine incremental lines on which at regular intervals the periostracum is laminar; aperture wide, white, the body and pillar with a thick coat of enamel, the pillar short, twisted, with a wide canal. Height, 30; height of last whorl, 24; diameter, 20 mm. U. S. Nat. Mus. Cat. No. 205098.

Type-locality.—Off Yokohama, Japan, in 600 fathoms.

This is *Chrysodomus trochoideus* Dall, 1907.

PLICIFUSUS (RETIFUSUS) INCISUS, new species.

Shell of moderate size, whitish, with a yellowish brown periostracum and about seven well-rounded rapidly increasing whorls, the nucleus eroded; suture distinct, deep; axial sculpture of numerous retractively arcuate small plications with subequal interspaces, extending from suture to suture, but becoming obsolete on the last part of the last whorl; the incremental lines evident but not conspicuous; spiral sculpture of (on the penultimate whorl about 8) flattish pairs of spirals divided by a shallow groove and the pairs separated by deeper, narrower, somewhat channeled grooves; between these and the preceding suture is a narrow band of closer threads; the former sculpture extends to the canal with much uniformity; aperture rather wide, the outer lip arcuate thin simple; the body with a thin layer of callus; the pillar straight; the canal short, wide, recurved; the operculum normal, with a glazed border on the inner side. Height of shell, 38; of last whorl, 26; of aperture, 19; diameter, 18 mm. U. S. Nat. Mus. Cat. No. 225614.

Type-locality.—U. S. Fish Commission station 3643, in the western Bering Sea, in 100 fathoms, sand; bottom temperature, 31.7° F.

PLICIFUSUS (RETIFUSUS) OCEANODROMAE, new species.

Shell of moderate size, bucciniform, acute, white, of about seven whorls, moderately rounded, the suture distinct, not appressed; axial sculpture of (on the last whorl about 22) narrow, rounded, retractively arcuate ribs, with subequal interspaces, extending from the suture to the base; the incremental lines not prominent; spiral sculpture of close-set flattish threads of somewhat irregular strength, often medially grooved, and having a tendency to associate in groups of two or three, these cover the whole surface; aperture buccinoid, retractively conspicuously waved near the suture, protractively arcuate beyond; throat white, body with a glaze, pillar slightly arcuate, canal wide, recurved; operculum with apical nucleus; height of shell, 34; of last whorl, 25; of aperture, 17; diameter, 16 mm. U. S. Nat. Mus. Cat. No. 205923.

Type-locality.—U. S. Fish Commission station 4777, on Petrel Bank, Bering Sea, in 52 fathoms, gravel.

COLUS (LATIFUSUS) PHARCIDUS, new species.

Shell of moderate size, white under an olivaceous periostracum, with six well-rounded whorls exclusive of the (lost) nucleus; suture distinct, deep; axial sculpture of faint incremental lines; spiral sculpture of a very few hardly visible lines in front of the suture on the upper whorls and near the canal; beside these there are irregular divergent raised lines on the periphery, such as have been noted in a number of species but which are doubtfully normal; aperture semilunate, outer lip thin, sharp, slightly arcuate, inner lip erased, pillar short, twisted, attenuate in front, axis pervious; canal wide, short, strongly recurved; height of shell, 30; of last whorl, 22; of aperture, 15; diameter, 15 mm. U. S. Nat. Mus. Cat. No. 205243.

Type-locality.—U. S. Bureau of Fisheries station 5015, in the Sea of Okhotsk, in 510 fathoms, green mud; bottom temperature, 35.9° F. The operculum is normal.

COLUS (AULACOFUSUS) NOBILIS, new species.

Shell large, regular, acute, whitish, with a warm yellow-brown persistent periostracum with eight whorls, exclusive of the very minute (lost) nucleus, separated by a very sharply defined suture, and elegantly rounded; spiral sculpture of (on the penultimate whorl about 15) flattened revolving close-set cords either in pairs or medially grooved for the most part, practically uniform over the whole shell; axial sculpture only of fine silky incremental lines; aperture rather wide, the outer lip expanded, thin, more or less crenulated internally by the effect of the external sculpture; body and pillar with a thick, continuous coat of enamel; canal distinct, short, slightly recurved; operculum solid, blackish, with apical nucleus. Height of shell, 85; of last whorl, 55; of aperture, 43; diameter, 38 mm. U. S. Nat. Mus. Cat. No. 222983.

Type-locality.—U. S. Fish Commission station 3484, in Bering Sea, near the Pribilof Islands, in 60 fathoms, mud; bottom temperature, 37.4° F.

COLUS (AULACOFUSUS) OMBRONIUS, new species.

Shell of moderate size, white with a dull olive gray periostracum, of more than six well-rounded whorls, the nucleus missing, the aperture longer than the spire; suture distinct; not appressed; axial sculpture of rather strong, regular and regularly spaced incremental lines which minutely corrugate the spirals: spiral sculpture of (on the penultimate whorl about a dozen) flattish cords, equal and equally spaced with much narrower interspaces; on the last whorl, especially near the periphery, these cords have a tendency to become keeled and the interspaces wider; aperture ovate, simple, the outer lip slightly expanded and reflecting the external sculpture, throat white, inner lip enameled, pillar twisted, almost pervious; canal two-thirds as long as the rest of the aperture, well recurved, height of shell, 50; of last whorl, 37; of aperture, 30; diameter, 21 mm. U. S. Nat. Mus. Cat. No. 213239.

Type-locality.—U. S. Fish Commission station 3252, in Bering Sea, between Bristol Bay and the Pribilof Islands, in about 30 fathoms, mud; bottom temperature, 44.8° F.

COLUS (AULACOFUSUS) ADONIS, new species.

Shell small, bulimiform, thin, whitish with a pale olive periostracum, with about six whorls exclusive of the (lost) nucleus, with a very narrowly channeled suture and moderately rounded whorls; spiral sculpture of narrow equal flat threads (about three to a millimeter) with very narrow interspaces over the whole shell, though the interspaces are a little wider on the apical whorls and the spirals under-run there by thread-like axial sculpture, giving a somewhat punctate appearance under magnification; aperture elongate, rather narrow, the outer lip thickened, not reflected, with traces of liration near the inside margin; the body and pillar with a continuous layer of enamel; canal short, wide, with no siphonal fasciole. Height of shell, 37; of last whorl, 25; diameter, 15 mm. U. S. Nat. Mus. Cat. No. 205212.

Type-locality.—U. S. Bureau of Fisheries station 5053, in Suruga Gulf, Japan, in 503 fathoms, mud; bottom temperature, 34.9° F.

The operculum is Chrysodomoid, but the liration is almost unique in the group and derives from the external sculpture.

COLUS (AULACOFUSUS) BRISTOLENSIS, new species.

Shell small, white under an olivaceous periostracum, with six rounded whorls and a very minute (decorticated) nucleus; suture distinct, not appressed; spiral sculpture of (on the penultimate whorl about 14) shallow grooves, becoming fainter on the last whorl, with much wider flat interspaces; axial sculpture of faint incremental lines; aperture wide, semilunate, the outer lip sharp, thin, arcuate; body with a thin coat of whitish enamel; pillar short, twisted, attenuated in front; canal short, wide, recurved; height of shell, 23.5; of last whorl, 18; of aperture, 13; diameter, 11.5 mm. U. S. Nat. Mus. Cat. No. 213254.

Type-locality.—U. S. Fish Commission station 3252, in Bering Sea, between Bristol Bay and the Pribiloff Islands, in 29½ fathoms, mud; bottom temperature, 44.8° F.

COLUS (AULACOFUSUS) BARBARINUS, new species.

Shell small, solid, pale gray, of about six whorls, the nucleus compressed axially and rather acute, suture distinct, not appressed, whorls conspicuously rounded; there is no axial sculpture except faint incremental lines, the apical whorls are decorticated; spiral sculpture of incised lines with slightly rounded wider interspaces, about a dozen on the penultimate whorl, quite uniform over the whole of the last whorl; aperture ovate, outer lip thin, sharp; inner lip erased, white; pillar short, twisted; canal short, rather wide, somewhat recurved. Height of shell, 20; of last whorl, 14; of aperture, 10; diameter, 9 mm. U. S. Nat. Mus. Cat. No. 334438.

Type-locality.—U. S. Fish Commission station 3282, off Khudubine Island, Bering Sea, in 53 fathoms; bottom temperature, 38.2° F.

The operculum is normal and rather large for the size of the shell.

COLUS (AULACOFUSUS) SAPIUS, new species.

Shell small, thin, the apical whorls eroded, but six prominently rounded turns remain; suture distinct, not appressed, the whorl in front of it flattened and without spiral sculpture for a short distance; the shell is white with a straw-colored periostracum; axial sculpture of faint incremental lines; spiral sculpture of (on the penultimate whorl about eight) strong squarish cords with subequal rather deep, channeled interspaces, both slightly wrinkled by the incremental lines and obsolete on the canal; there are a few minor spirals behind the posterior cord; aperture roundly ovate, outer lip thin, simple, inner lip erased, pillar white, twisted, axis pervious; canal rather long, narrow, well defined, somewhat recurved; height of shell, 22; of last whorl, 15; diameter, 11 mm. U. S. Nat. Mus. Cat. No. 122597.

Type-locality.—U. S. Fish Commission station 2859, southwest of Sitka, Alaska, in 1,569 fathoms, ooze.

COLUS (AULACOFUSUS) CALATHUS, new species.

Shell small, thin, white under a straw-colored periostracum, with more than six well-rounded whorls, the apex defective; suture distinct, not appressed; axial sculpture of faint incremental lines; spiral sculpture of (on the penultimate whorl 13) fine rounded low subequal cords with narrower interspaces, the cords at and below the periphery a little more close-set, this sculpture covering the whole shell very evenly; aperture wide, the outer lip thickened and slightly crenulated by the external sculpture, body erased; pillar short, attenuated in front; canal short, wide, slightly recurved; height of shell, 26; of last whorl, 18; of aperture, 12; diameter, 13 mm. U. S. Nat. Mus. Cat. No. 106864.

Type-locality.—U. S. Fish Commission station 2853, near the Shumagin Islands, Alaska, in 159 fathoms, sand.

COLUS (AULACOFUSUS) CAPPONIUS, new species.

Shell of moderate size, the spire longer than the aperture, white, with a thin polished, olivaceous periostracum, and more than five whorls (the apex defective); whorls moderately rounded, suture distinct, deep; axial sculpture of fine silky incremental lines, sometimes with a tendency to cause wrinkles near the suture; spiral sculpture of (on the penultimate whorl about 17) regular narrow rather deep grooves with much wider flattish interspaces, uniformly covering the whole surface of the shell; aperture about twice as long as wide, outer lip retractively arcuate behind and protractively anteriorly, not reflected; pillar lip with a thin glaze, pillar white; canal short, wide, hardly reflected; height of shell, 40; of last whorl, 27; of aperture, 18; diameter, 18 mm. U. S. Nat. Mus. Cat. No. 108980.

Type-locality.—Bering Strait, near Port Clarence, W. H. Dall.

COLUS (AULACOFUSUS) HALIDONUS, new species.

Shell of moderate size, short, stout, white with an olivaceous periostracum, with about six whorls, the apex defective, suture distinct, not appressed; axial sculpture of fine, equal, close-set incremental lines; spiral sculpture of (on the penultimate whorl about 16) fine channeled grooves with wider flat interspaces, of which two behind the suture are wider than the others; on the base the posterior edge of these interspaces is raised and the anterior lowered to the level of the bottom of the grooves giving the effect of narrow threads with much wider intervals; these two varieties of sculpture cover the whole shell; aperture wide, the outer lip somewhat reflected, body erased, pillar short, gyrate, axis pervious; canal short, very wide, recurved and flaring anteriorly; operculum normal; height of shell, 35; of last whorl, 27; of aperture, 20; diameter, 20 mm. U. S. Nat. Mus. Cat. No. 213250.

Type-locality.—Off Destruction Island, Washington, in 516 fathoms.

AULACOFUSUS (LIMATOFUSUS) PULCIUS, new species.

Shell of moderate size, of about six rounded whorls, the apex eroded, shell substance of a pale livid brown, covered by an olivaceous periostracum, the suture distinct and deep; axial sculpture of uniform fine silky incremental lines; spiral sculpture of uniform flattened spirals separated by narrow grooves, about 27 to 30 spirals on the penultimate whorl; aperture ovate, outer lip thin (immature?) slightly crenulated by the external sculpture, inner lip erased, brownish, pillar white, straight; canal short, wide, deep, forming a well marked fasciole; height of shell, 38; of last whorl, 26; of aperture, 18; diameter, 17 mm. U. S. Nat. Mus. Cat. No. 223799.

Type-locality.—Arctic Ocean, north of Bering Strait, collected by Capt. M. A. Healy of the revenue marine steamer *Corwin*.

Operculum normal, dark brown.

AULACOFUSUS (LIMATOFUSUS) TIMETUS, new species.

Shell small, thin, with a thin pale olive periostracum, and five or more whorls, the apex eroded; suture distinct, not appressed; axial sculpture none; spiral sculpture of (on the penultimate whorl about

33) fine regular sharp striae with wider flat interspaces, for the most part uniform, but near the periphery tending to be wider, this sculpture covering the whole surface; aperture wide, semilunate, outer lip gently arcuate, thin, inner lip erased, white, pillar straight, attenuated in front, canal wide, deep, very short, with a well-marked siphonal fasciole; height of shell, 30; of last whorl, 22; of aperture, 15; diameter, 16 mm. U. S. Nat. Mus. Cat. No. 213337.

Type-locality.—U. S. Fish Commission station 3333, off Iliuliuk Harbor, Captains Bay, Unalaska, Aleutian Islands, in 19 fathoms, mud; bottom temperature 43.9° F.

AULACOFUSUS (LIMATOFUSUS) TROPHIUS, new species.

Shell of moderate size, short, white, with a pale olivaceous periostracum with more than five well-rounded whorls, the apex eroded; suture distinct, not appressed; axial sculpture of faint concavely arcuate incremental lines; spiral sculpture of (on the penultimate whorl about a dozen) sharp narrow channeled grooves, with considerably wider flat interspaces, which, on the last whorl, are more or less divided by a shallow median groove; this sculpture is practically uniform over the whole surface; aperture wide, simple, white within; outer lip slightly reflected, thin, body erased; pillar short, straight; axis pervious; height of shell, 32; of last whorl, 26; of aperture, 21; diameter, 19 mm. U. S. Nat. Mus. Cat. No. 122628.

Type-locality.—U. S. Fish Commission station 3071, in 685 fathoms, mud, off Sea Lion Rock, coast of Washington.

AULACOFUSUS (LIMATOFUSUS) MORDITUS, new species.

Shell small, solid, polished, of about seven whorls, the apex decorticated, rather acute, the whorls moderately rounded, the suture distinct, not appressed; axial sculpture of feeble incremental lines, their intersections slightly punctating the grooves; spiral sculpture of numerous shallow grooves with much wider flattish interspaces over the whole surface; outer lip thin, sharp, arcuate; inner lip erased, pinkish, pillar white, attenuated in front; canal wide, distinct, short, slightly recurved; height of shell, 28; of last whorl, 20; of aperture, 15; diameter 13 mm. U. S. Nat. Mus. Cat. No. 222599.

Type-locality.—U. S. Fish Commission station 4198, in the Gulf of Georgia, in 200 fathoms, mud; bottom temperature, 48.6° F.

There are numerous irregular branching grooves on the surface, like the burrows of *Cliona*, but I regard them as abnormal and probably due to some parasite. The operculum is normal.

AULACOFUSUS (LIMATOFUSUS) DIMIDIATUS, new species.

Shell small, white, with a pale olivaceous periostracum, with five or more rounded whorls (the apex defective and the specimens not quite mature) separated by a rather deep suture; spiral sculpture peculiar, consisting of numerous crenulated grooves with much wider slightly concave interspaces disposed without regularity but on the last whorl numbering over 30, the interspaces widest near the periphery; the crenulation of the grooves is probably due to incremental lines not elsewhere especially noticeable; aperture elongate, outer lip (immature) thin, sharp; body and pillar erased; canal rather long and recurved; axis pervious; operculum thin, the nucleus apical, somewhat curved to the left; height of shell, 16; of last whorl, 12; diameter, 8 mm. U. S. Nat. Mus. Cat. No. 213338.

Type-locality.—U. S. Fish Commission station 3346, off Tillamook Bay, Oregon, in 786 fathoms, ooze; bottom temperature, 37.3° F.

The sculpture is different from that of any other of the group I have been able to examine.

AULACOFUSUS (LIMATOFUSUS) SEVERINUS, new species.

Shell small, white, covered with a straw-colored periostracum, with about six rounded whorls, the apex eroded, the suture distinct, not appressed; axial sculpture of obscure incremental lines; spiral sculpture of slightly irregular flattish cords separated by narrower channeled grooves; on the penultimate whorl there are 15 to 17 of these cords; beside these the surface is profusely scored with incised, more or less oblique, sometimes divaricate grooves, which I take to be abnormal; aperture wide, outer lip convexly arcuate, slightly expanded and thickened; inner lip with a layer of white enamel, pillar short; canal very short, wide, deep, recurved; operculum normal, dark brown; height of shell, 33; of last whorl, 25; of aperture, 17; diameter, 18 mm. U. S. Nat. Mus. Cat. No. 225225.

Type-locality.—U. S. Fish Commission station 3669, Bay of Monterey, California, in 278 fathoms, sand; bottom temperature, 42.7° F.

AULACOFUSUS (LIMATOFUSUS) HALIMERIS, new species.

Shell small, whitish with a yellow-brown periostracum and five whorls, including a swollen subglobular nucleus, spire otherwise rather acute, the whorls moderately rounded; suture distinct, not appressed; spiral sculpture of numerous fine shallow squarish grooves, separated by wider flattish interspaces, these covering the whole surface; axial sculpture of faint incremental lines; aperture ovate, outer lip thin, simple, body erased, pillar short and twisted; canal short, wide, recurved; height of shell, 21; of last whorl, 15; of aperture, 11; diameter, 10 mm. U. S. Nat. Mus. Cat. No. 207192.

Type-locality.—U. S. Fish Commission station 4248, in Eastern Passage, near the Stikine River, southeastern Alaska, in about 70 fathoms, mud; bottom temperature, 42.8° F.

The specimen may not be completely adult.

AULACOFUSUS (LIMATOFUSUS) TROMBINUS, new species.

Shell small, short, rotund, with about five whorls, the apex eroded, white with a pale olivaceous dull periostracum; suture distinct, not appressed; axial sculpture of fine, regular, almost microscopic, incremental lines crossing the outer sculpture but hardly visible except with a lens; spiral sculpture of (on the penultimate whorl about 10, on the last whorl about 25) narrow, almost channeled grooves, with slightly rounded broader interspaces, sometimes divided by a smaller groove, and feebler near the suture and on the canal; outer lip thin, sharp, arcuate; inner lip erased, pillar white, short, twisted; canal short, wide, distinctly recurved; operculum normal, rather short and wide, in harmony with the aperture; height of shell 16; of last whorl, 14; of aperture, 11; diameter, 10 mm U. S. Nat. Mus. Cat. No. 213332.

Type-locality.—U. S. Fish Commission station 3253, in Bering Sea, off the Pribiloff Islands in 36 fathoms; bottom temperature, 35° F.

COLUS (LATISIPHO) ERRONES, new species.

Shell of moderate size, dark reddish brown, acute, with six rapidly increasing moderately convex whorls and a glassy subglobular smooth nucleus of about one whorl; suture distinct, not appressed; periostracum polished; axial sculpture of faint incremental lines; spiral sculpture of the early whorls of numerous fine striae, covering the whole surface with wider flat interspaces; this sculpture continues, becoming less and less evident until except under a lens the surface appears to be smooth except on the canal; aperture semilunate, outer lip thin, simple, sigmoidly arcuate; throat whitish, body with a thin callus, pillar straight, attenuated in front; canal short, wide, strongly recurved; height of shell, 47; of last whorl, 32; of apertnre, 23; diameter, 22 mm. U. S. Nat. Mus. Cat. No. 226227.

Type-locality.—Bering Sea, U. S. Fish Commission.

COLUS (LATISIPHO) CLEMENTINUS, new species.

Shell small, white, with a greenish olive periostracum, and more than five rounded whorls, the apex decorticated; suture distinct, not appressed; axial sculpture of irregularly prominent incremental lines; spiral sculpture of a few irregular interrupted spiral threads, probably accidental, and some feeble grooves near the canal; surface practically smooth, almost polished; aperture semilunate, the outer lip thin, arcuate, body with a coat of white enamel, the pillar white, short, twisted, attenuate in front; canal wide, short, slightly recurved; height of shell, 21; of last whorl, 15; of aperture, 11; diameter, 10 mm. U. S. Cat. Mus. Cat. No. 208912.

Type-locality.—U. S. Fish Commission station 4405, between Santa Catalina and San Clemente Islands, California, in 654 to 704 fathoms, mud; bottom temperature, 39.4° F.

COLUS (LATISIPHO) DALMASIUS, new species.

Shell of moderate size, acute, white, covered with a dark reddish brown periostracum with a subglobular polished nucleus of about one whorl and six subsequent well-rounded, rapidly enlarging whorls; suture distinct, not appressed; axial sculpture of feeble incremental lines; spiral sculpture of numerous flattened threads with narrow obscurely channeled interspaces, coarser on the canal; aperture wide, outer lip thickened, arcuate, slightly expanded; body with a thin white layer of callus, pillar short, twisted; canal wide, short, strongly recurved; height of shell, 35; of last whorl, 25; of aperture, 18; diameter, 20 mm. U. S. Nat. Mus. Cat. No. 122631.

Type-locality.—U. S. Fish Commission station 2862, off the coast of British Columbia, in 238 fathoms, sandy bottom.

This is a dwarfish imitation of *L. errones.*

CHRYSODOMUS SMIRNIUS, new species.

Shell of moderate size, acute, livid purple-brown, with a semitranslucent whitish overlayer, and a thin dehiscent olivaceous periostracum; nucleus small, irregularly swollen, of about one whorl, with about five subsequent whorls; the earlier two or three whorls have four or five low, wide, flat spiral cords with obscurely channeled interspaces, these rapidly become obsolete and the last whorl appears quite smooth except for fine silky incremental lines; suture distinct, somewhat appressed; aperture wide, ovate, angular behind, the outer lip expanded, white, the throat dark brown, the body with a thin glaze which extends to the pillar, which is twisted and attenuated; the canal short, wide, somewhat recurved; operculum normal. Height of shell, 50; of last whorl, 39; of aperture, 30; maximum diameter, 26 mm. U. S. Nat. Mus. Cat. No. 130418.

Type-locality.—U. S. Fish Commission station 3461, in the Straits of Fuca, in 114 fathoms, sand, bottom temperature 44.2° F. The species ranges northward to Bering Sea. The type-specimen is a female.

CHRYSODOMUS NUCEUS, new species.

Shell small for the genus, solid, yellowish, rather acute, with six whorls exclusive of the (lost) nucleus, suture distinct, narrow, deep; spiral whorls flattish behind the periphery at which there is an obscure angle; in front of this are a few obscure spirals, indicated by color rather than elevation in the type-specimen; incremental lines inconspicuous, rather rude; aperture white, outer lip sharp, slightly expanded; body and pillar with a thick white enamel; canal short, recurved, with a strong fasciole. Height of shell, 62; of last whorl, 50; diameter, 35 mm. U. S. Nat. Mus. Cat. No. 151429.

Type-locality.—Cook's Inlet, Alaska; Arnheim.

This species ranges to the Arctic Ocean.

CHRYSODOMUS PRIBILOFFENSIS, new species.

Female shell, rather thin, inflated, short spired, with about six whorls exclusive of the (lost) nucleus; the suture distinct with a flattish or slightly excavated space on the whorl in front of it, beyond which the whorl is evenly rounded; the color is a warm buff, increasing to orange on the enamel of the pillar; axial sculpture of fairly obvious, fine, incremental lines; spiral sculpture of a strong cord at the shoulder, 2 on the apical whorls, 3 on the penultimate whorl, 8 or 10 on the last whorl, of which that at the shoulder is the strongest; between these cords are three to five flattish, less elevated close-set threads, except on the canal, where the spirals are wider, flatter, and more or less obsolete; aperture broad, outer lip thin, sharp, body and pillar with a layer of enamel, the pillar short, strongly twisted; the canal rather wide with no marked fasciole; the operculum black, rather wide, ovate with apical nucleus bent to the left. Height of shell, 94; of last whorl, 77; diameter, 60 mm. U. S. Nat. Mus. Cat. No. 225603.

Type-locality.—Off the Pribilof Islands, Bering Sea, in 50 to 100 fathoms.

CHRYSODOMUS VINOSUS, new species.

Shell thin, with acute spire, of a pinkish flesh color intensified to vinose near the apex, the nucleus bulbose, swollen, of one whorl, with five subsequent rapidly increasing whorls; suture distinct, deep, very narrow, the whorl in front of it flattish or slightly concave to a prominent darker stronger cord at the shoulder, which on the apical whorls is peripheral; the suture is laid against a weaker cord, the remainder of the surface, obsoletely minutely spirally striated; axial sculpture of rather regular silky incremental lines; aperture wide, the outer lip sharp, body and pillar with a thin layer of enamel; the pillar twisted, the axis pervious, the canal wide and strongly recurved, but showing no fasciole. Operculum black with apical nucleus. Height of shell, 90; of last whorl, 70; diameter, 49 mm. U. S. Nat. Mus. Cat. No. 225608.

Type-locality.—Western Bering Sea and Avacha Bay, Kamchatka, in 16 fathoms.

CHRYSODOMUS SATURUS Martyn, new variety TABULARIS.

Shell of moderate size, very heavy and solid, the six whorls flatly tabulate in front of the suture, rude, of a grayish color, the nucleus lost; the suture distinct, not appressed; the apical whorls finely spirally closely threaded, but the rest of the shell without sculpture except rude incremental lines; aperture rounded, outer lip heavy, body and very short pillar with a thick coat of enamel; canal short, very narrow and deep, recurved, with wide umbilical cavity between a very prominent fasciole and the enamel of the pillar. Height of shell, 62; of last whorl, 50; diameter, 44 mm. U. S. Nat. Mus. Cat. No. 31350.

Type-locality.—Bering Sea, near Nunivak Island.

All the specimens seen of this singular variety are much worn and mostly somewhat imperfect, so that the complete lengths would probably be greater than those given.

CHRYSODOMUS HYPOLISPUS, new species.

Shell small, yellowish under an olivaceous periostracum, with about five whorls, including a swollen subglobular nucleus wider than the succeeding whorl; suture distinct, not appressed; whorls rapidly enlarging; axial sculpture only of faint incremental lines; spiral sculpture of, on the spire, faint irregular low threads, finer in a band near the preceding suture; on the last whorl these become more evident, though not strong, and extend to the canal; the interspaces are shallow narrow grooves; aperture rather wide, the outer lip thin, sharp; the body erased, the pillar short, twisted; the canal short, wide, recurved. Height of shell, 43; of last whorl, 32; of aperture, 24; diameter, 22 mm. U. S. Nat. Mus. Cat. No. 205246.

Type-locality.—U. S. Bureau of Fisheries station 4991, in the Japan Sea, in 325 fathoms, mud.

The operculum is normal. It is probable that the specimen is not full grown.

BUCCINUM TENUE Gray, 1849.

From the original type of Gray, as determined by Stimpson, various derivatives may apparently be traced, most of which have secured specific rank, while other still exhibit connecting links. Among the latter is a large rude form with much emphasized more or less broken irregular ribs (Cat. No. 224069) and a conspicuous reddish brown periostracum, with more than seven whorls, a deep suture, and cream-colored enamel. The type-specimen measures 89 mm. in length with a diameter of 40 mm. For this form the varietal name of *rhodium* is now proposed. Another form from the eastern coast of Kamchatka in 100 fathoms (Cat. No. 225611) has a strongly constricted suture and about six rotund whorls, with the axial sculpture largely obsolete and the periostracum a very dark olive; this is 52 mm. long and 32 mm. in diameter. In its other characters it agrees with the normal type of the species. I propose for this variety the name of *lyperum*.

BUCCINUM SOLENUM, new species.

Shell of moderate size, acute, white under a dehiscent straw-colored periostracum, with a strongly constricted suture and about six slightly shouldered somewhat rotund whorls, exclusive of the (lost) nucleus; the whorls of the spire are numerously ribbed (about 20 on the penultimate whorl), with slightly oblique riblets most emphatic on the shoulder, obsolete at the periphery and on the last whorl; the incremental lines are prominent, close, and threadlike; spiral sculpture of very minute, closely undulated, close-set striae, which gave a somewhat granular or punctuate aspect to the intervals between the axial threads; on the periphery of the last whorl are a few obsolete, stronger spirals; aperture wide with a conspicuous gutter somewhat in front of the shoulder in the outer lip; a glaze of enamel on the body and pillar, a short shallow recurved canal, and a well-marked siphonal fasciole; the operculum nearly circular, laminose externally, with central nucleus. Height of shell, 47; of last whorl, 34; diameter, 30 mm. U. S. Nat. Mus. Cat. No. 222485.

Type-locality.—U. S. Fish Commission station 3518, off Nunivak Island, Bering Sea, in 36 fathoms, mud; bottom temperature, 40° F. Also off Unimak Island in 46 fathoms.

This is nearest to some mutations of *B. polare* Gray, 1839.

BUCCINUM CHARTIUM, new species.

Shell of medium size, white, with a very pale olive-gray, thin, dehiscent periostracum, with about eight gradually increasing whorls (the nucleus defective) separated by a well-marked suture; spiral sculpture of three rather prominent subequal cords, one at the shoulder, one at the periphery, and one midway between the others, the interspaces equal, wider and carrying two or three intercalary alternating threads; on the last whorl in the type-specimen, in front of the periphery, are about 20 subequal and equally spaced flattish threads with narrower very shallow interspaces; the canal has no spiral sculpture; axial sculpture of fine vertical threads with wider interspaces; aperture more or less sinuous behind, slightly reflected; body white, erased, pillar nearly straight; canal short, wide, recurved with a feeble fasciole; operculum small, smooth, concave, with the nucleus somewhat to the left of the center. Height of shell, 60; of last whorl, 32; diameter, 44 mm. U. S. Nat. Mus. Cat. No. 226270.

Type-locality.—U. S. Bureau of Fisheries station 3709, off Honshu Island, Japan Sea, in 260 fathoms, muddy bottom.

The specimen is a female.

BUCCINUM PEMPHIGUS, new variety MAJOR.

Male shell, large, thin, inflated, white with an adherent olivaceous periostracum, with seven whorls exclusive of the minute (eroded) nucleus; suture distinct, spiral sculpture of a low narrow keel at the shoulder and numerous flattish, close-set, usually paired or duplex threads, uniformly covering the whole surface; incremental lines inconspicuous; aperture wide, white, the outer lip thin, narrowly reflected; body and pillar with a glaze of enamel; pillar short, straight; canal wide, short, somewhat recurved, with a moderate fasciole; operculum large, rounded triangular with subcentral nucleus. Height of shell, 86; of last whorl, 64; of aperture, 50; diameter, 55 mm. U. S. Nat. Mus. Cat. No. 225248.

Type-locality.—U. S. Fish Commission station 3643, in the western part of Bering Sea, in 100 fathoms, gravel; bottom temperature, 31.7° F.

Some of the specimens are destitute of the keel at the shoulder.

BUCCINUM PLANETICUM, new species.

Female shell of moderate size, acute, with a distinct not constricted suture and seven rounded whorls exclusive of the (lost) nucleus; shell of a warm buff color, the thin periostracum dehiscent; axial sculpture of, on the upper whorls, about a dozen low obscure ribs only apparent behind the periphery and absent on the last whorl; the lines of growth are hardly perceptible; spiral sculpture of very fine close threads, raised slightly into fasciculate bands of five or six threads, the interspaces more distinctly defined on the base than behind the periphery; this sculpture covers the whole shell; the aperture wide, the margin in the type-specimen deeply sulcate behind, hardly reflected, patulous in front; body erased, pillar nearly straight; canal very short, wide, sharply recurved, with a feeble fasciole; height of shell 65; of last whorl, 45; diameter, 35 mm. U. S. Nat. Mus. Cat. No. 223098.

Type-locality.—U. S. Fish Commission station 3305, southwest of Hagmeister Island, eastern Bering Sea, in 23 fathoms, sand; bottom temperature, 41.8° F.

This species seems common to the eastern littorale of Bering Sea, from Nunivak Island to Bristol Bay, and recalls *B. tenebrosum* Hancock.

BUCCINUM RONDINUM new species.

Shell small, pale straw color, thin, with about five well-rounded whorls, the nucleus eroded; suture distinct, not appressed; axial sculpture of fine close minute incremental lines on which the periostracum rises in minute, equal lamellae; spiral sculpture of low minute equal threads with equal or wider interspaces, over the whole surface; aperture with outer lip simple, arcuate, with the extreme margin slightly expanded; inner lip white, erased; pillar short, thin, twisted; canal wide, deeply excavated, hardly differentiated; height of shell, 20; of last whorl, 16; of aperture, 11; diameter, 11 mm. U. S. Nat. Mus. Cat. No. 110534*a*.

Type-locality.—U. S. Fish Commission station 2853, off Alaska Peninsula in 159 fathoms, sand, bottom temperature, 44.8° F.

BUCCINUM CASTANEUM Dall, 1877.

This remarkable species was originally described from an apparently smooth but very minutely spirally striated specimen from the Shumagin Islands. Later I named a variety with three very prominent spiral cords on the last whorl variety *tricarinatum*. I find, however, that Bruguière named a (*Nassa*) *Buccinum tricarinatum*, so I propose for this variety the designation of *triplostephanum*. As the collection has increased, other specimens of this rare species have come to hand extending the limits of its variability. A form without spiral cords but with (on the last whorl about 10) somewhat irregularly arcuate coarse ribs, and larger than the original type, was collected at the island of St. George (Cat. No. 217152) in Bering Sea, at a depth of 30 fathoms; for this the varietal name *fluctuatum* is now proposed. Still another form from the Unimak Pass, Aleutian chain, in 56 fathoms (Cat. No. 213159) is smaller than the original type and has (on the last whorl about 19) more numerous smaller ribs, which on the periphery are more or less broken up into nodules, and has the fine spiral striation fasciculated by the presence at irregular intervals of deeper spiral grooves; for this form the name *incisulum* is now proposed. In the thickening and arcuation of the outer lip all these forms agree, as well as in the other general characters of the type. It would not be surprising if, when a large number of specimens from different localities are brought together, other combinations of the sculptural characters should be revealed.

BUCCINUM ROSSELLINUM, new species.

Shell small, very thin, of a dull dark olive color, the suture deep, not appressed; with about six well-rounded whorls, the apex eroded; axial sculpture of fine, close, even, silky incremental lines; spiral sculpture of fine, close, equal flattish threads on the spire which later take on the aspect of rather wide flat interspaces between shallow grooves, here and there with a slightly more elevated spiral thread; aperture ovate, outer lip thin, sharp, perhaps not quite mature; inner lip white, erased, pillar short, twisted; canal very short, slightly recurved, wide, with a faint siphonal fasciole; height of shell, 27; of last whorl, 21; of aperture, 14; diameter, 16 mm. U. S. Nat. Mus. Cat. No. 206449.

Type-locality.—U. S. Fish Commission station 3340, southeast of Chirikoff Island, Alaska, in 695 fathoms, mud, bottom temperature, 36.8° F.

The operculum is subcircular, thin and normal.

BUCCINUM PHYSEMATUM, new species.

Female shell rather large, thin, inflated, acute, whitish, whorls rapidly enlarging, about six and a half in number, the nucleus decorticated, the suture deep, not channelled; spiral sculpture of very numerous somewhat irregular, fine threads, mostly with narrower interspaces and with little or no tendency to fasciculation, an angle at the margin of the base; penultimate whorl with about 16 narrow, retractively arcuate ribs, extending from suture to suture with wider interspaces but obsolete on the last whorl; aperture wide, cream colored, the outer lip thin, arcuate, reflected, the body erased, the pillar short, slightly twisted, with a wide, very short canal and moderate fasciole. Height of shell, 60; of last whorl, 47; diameter, 40 mm. U. S. Nat. Mus. Cat. No. 122555.

Type-locality.—U. S. Fish Commission station 3253, in Bering Sea, in 29½ fathoms, mud.

This has the aspect of a very large thin *B. angulosum*, but the minor sculpture is quite distinct.

BUCCINUM ANGULOSUM, new variety CNISMATOPLEURA.

Shell thin, white, variable in height, the type-specimen short, acute, with five whorls exclusive of the (lost) nucleus, separated by a distinct suture; axial sculpture of (on the penultimate whorl 11, on the last whorl 8) stout ribs with equal (on the spire) or wider (on the last whorl) interspaces; on the spire these extend from suture to suture without special prominence on any one part of the whorl, but on the last whorl they are obsolescent near the suture and on the base, but on the periphery are very prominent, as if pinched and pulled out, rudely and irregularly; the incremental lines are inconspicuous; the spiral sculpture is like that of the typical form, fine similar uniform striae now and then fasciculated by deeper grooving; aperture wide, outer lip flexuous, thin; body erased, pillar short straight, canal wide, deep, recurved with a strong fasciole. Height of shell, 48; of last whorl, 40; diameter, 36 mm. Another specimen measures—height of shell, 47; of last whorl, 35; diameter (not quite mature), 26 mm. U. S. Nat. Mus. Cat. No. 332759.

Type-locality.—Point Barrow, Arctic coast of Alaska, on the beach. The second specimen, from between Cape Beaufort and Cape Lisburne, has on the penultimate whorl 9 and on the last whorl 11 ribs. This variability is common in this species and isolated individuals are often very unlike.

BUCCINUM ANGULOSUM, new variety TRANSLIRATUM.

Shell of moderate size, thin, somewhat inflated, with about five whorls exclusive of the (lost) nucleus; the suture gently appressed;

spiral sculpture in minor particulars like that of *B. angulosum*, but with four strong rounded cords, with much wider subequal interspaces on the last whorl and eight or more irregular feeble ribs obsolete in front of the suture also on the base; other axial sculpture of very fine hardly visible incremental lines; aperture creamy white, the outer lip thin, hardly reflected, the body glazed, the pillar slender, arcuate, short, with a deep short, rather wide canal and a strong siphonal fasciole; the periostracum thin, pale yellowish, smooth. Height of shell, 46; of last whorl, 36; diameter, 28 mm. U. S. Nat. Mus. Cat. No. 221455.

Type-locality—Point Belcher, Arctic coast of Alaska, on the beach: collected by W. H. Dall.

CANTHARUS EXANTHEMATUS, new species.

Shell small, brownish, with a smooth turbinate rapidly enlarging nucleus of three and a half whorls and three and a half subsequent whorls; suture obscure, somewhat undulate; axial sculpture of (on the penultimate whorl about 18) obscure vertical ribs with somewhat narrower interspaces, extending on the last whorl to the base, and cut by the spiral sculpture into conspicuous nodules; there are also fine slightly raised close-set, incremental lines most conspicuous inthe interspaces; the spiral sculpture consists chiefly of a pair of peripheral threads conspicuously nodulating the ribs and another similar thread in front of the suture; as the shell grows, intercalary not nodulous small threads appear in the interspaces, and on the last whorl a few still smaller intercalaries begin; this sculpture also is found on the base; aperture semilunate, simple, body erased; pillar short, canal short, slightly recurved; the interior of the outer lip has five short prominent lirations, similar and subequally spaced; height of shell, 8.5; of last whorl, 6; diameter, 4.2 mm. U. S. Nat. Mus. Cat. No. 96771.

Type-locality—U. S. Fish Commission station 2837, off Lower California in 23 fathoms, sand.

This belongs to the group of *C. orbignyi* Payraudeau.

ANACHIS PHANEA, new species.

Shell small, acute, slender, white, with six flattish whorls exclusive of the smooth glassy nucleus of about one whorl; suture distinct; the first two whorls flat and smooth, the subsequent whorls with (on the last whorl about 14) nearly vertical narrow, straight, rather sharp ribs with shallow much wider insterspaces extending over the periphery; surface polished, base attenuated, smooth, aperture narrow, outer lip simple, body erased, pillar short, axis pervious; canal short, deep, wide, with a marked siphonal fasciole bordered behind with a brown line; there are a few feeble spiral striae on the back of the canal; height of shell 9; of last whorl, 6; of aperture, 4; diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 219671.

Type-locality—Salina Cruz, Mexico; C. R. Orcutt.

It is quite probable that a series would show variations of color.

ALIA CALLIMORPHA, new species.

Shell small, yellowish, with brown mottlings under a thin brownish periostracum, with about five whorls; including a small smooth nucleus; suture obscure, whorls only slightly convex on the spire; surface smooth except for a few spiral striae on the canal; aperture narrow, with a rather wide commissure at the posterior junction of the lip and body; outer lip slightly thickened, with four or five denticles on the inner face; body polished, pillar short; canal short and wide; height of shell 5; of last whorl, 3.5; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 271491.

Type-locality.—San Diego, California, C. R. Orcutt.

This belongs with the group of *A. californiana*, from which it differs by its much smaller size, relatively more slender form, and less pronounced coloration.

ALIA XENIA, new species.

Shell large for the genus, acute, waxen white, with abundant reddish brown painting—clouds, streaks, or occellations—with about nine rather flat-sided whorls, exclusive of a swollen smooth nucleus of about one whorl more; suture distinct, not appressed; surface smooth and polished, except for half a dozen spiral grooves on the canal; aperture narrow, the outer lip thickened with a slight varical swelling behind it; internally adults have about eight denticulations; body enameled, pillar also with a few obscure nodulations; canal short, slightly recurved; height of shell, 18; of last whorl, 10; diameter, 6 mm. U. S. Nat. Mus. Cat. No. 59370.

Type-locality.—Cape San Lucas; W. H. Dall.

This species is more nearly related by its shell characters to Australian species like *Columbella intexta* Gaskoin than to the usual West American types.

ALIA CASCIANA, new species.

Shell small, yellowish, acute, with a three-whorled smooth nucleus beginning with a very minute apex and five flattish subsequent whorls; suture distinct, minutely channeled; axial sculpture of faint incremental lines; spiral sculpture of very faint striae on the whorls behind the periphery, and a few stronger grooves near and on the canal; base subangular at the periphery, flattened in front; aperture narrow, simple, body slightly glazed, pillar short with a strong keel at its anterior border; canal short, deep,; height of shell, 9; of last whorl, 6; of aperture, 3.5; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 209456.

Type-locality.—U. S. Fish Commission station 4322, off La Jolla, San Diego County, California, in 110 to 199 fathoms, shelly mud.

This species when fully adult probably has a few denticulations on the inside of the outer lip, and in fresh specimens the color may be variable. All those obtained at this station were "dead" shells.

ASTYRIS AMIANTIS, new species.

Shell small, pure white, solid, with seven moderately-rounded whorls exclusive of the (lost) nucleus; suture distinct, not appressed; axial sculpture of more or less evident incremental lines, sometimes so strong as to suggest riblets; spiral sculpture of fine threads, almost obsolete on most of the shell but coarser and more evident near the canal, covering the whole surface with narrower interspaces; aperture semilunate, outer lip simple, body erased, pillar very short, canal hardly differentiated; heigth of shell, 13; of last whorl, 8; of aperture, 4; diameter, 6 mm. U. S. Nat. Mus. Cat. No. 221008.

Type-locality.—Beach at Kiska Harbor, Aleutians, station 1026; W. H. Dall.

? NITIDELLA LUTULENTA, new species.

Shell small, pale, with pale variations of brown or none, covered with a fibrous pale brownish periostracum; with about six whorls, including an extremely minute smooth nucleus; suture distinct, not appressed; surface of the whorls moderately convex; axial sculpture none but faint incremental lines; spiral sculpture only of a few spiral grooves on the back of the canal; aperture simple, the outer lip thin, not lirate within, body with a slight glaze, pillar thickened with an obvious keel on its anterior edge; canal short, wide; operculum normal; height of shell, 7; of last whorl, 5.5; diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 211068.

Type-locality.—U. S. Fish Commission station 3180, in the Gulf of the Farallones, off San Francisco, in 24 fathoms; bottom temperature, 50.7° F.

This may prove to be an *Alia*.

AMPHISSA VERSICOLOR, new variety INCISA.

Shell varicolored, acute, solid, with a thin brownish fibrous periostracum, with about eight whorls, including the smooth nucleus of about one whorl, the rest of the shell strongly sculptured; spiral sculpture of (on the spire about 6, on the last whorl about 16) strong, low, rounded, equal, and equally spaced cords, except one in front of the almost channeled suture, which is slightly more prominent than the others, separated by much narrower deep grooves; the spirals not nodulous when they cross the ribs; axial sculpture of (on the penultimate whorl about 14) obliquely protractive rounded ribs with subequal interspaces, somewhat obsolete near the aperture, which is semilunate; outer lip hardly thickened, whitish, lirate within; body and pillar with a layer of whitish enamel; canal short, deep, slightly recurved; height of shell, 13.5; of last whorl, 10; of aperture, 6.5; diameter, 7 mm. U. S. Nat. Mus. Cat. No. 12285.

Type-locality.—Laguna Beach, California; Stearns collection. Differs from the typical *versicolor* by the strength of the sculpture, deep grooving, and generally by the duller color.

AESOPUS ARESTUS, new species.

Shell small, thin, slender, suffused with yellowish and white or ocellated somewhat like *Nitidella ocellata* with pale brown on a white ground, with six subcylindric whorls including a smooth swollen nucleus of about one whorl; suture distinct, not appressed; axial sculpture of numerous narrow nearly obsolete vertical riblets on the upper part of the spire, which are absent from the last whorl, except in the form of feeble vertical wrinkles; spiral sculpture none; aperture short, simple, outer lip thickened, not reflected, body with a layer of enamel, pillar lip thickened, slightly twisted, shorter than the outer lip; canal very short and deep; height of shell, 7; of last whorl, 3.8; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 217928.

Type-locality.—Magdalena Bay, Lower California; collected by C. R. Orcutt.

MUREX (ALIPURPURA) RHYSSUS, new species.

Shell elongate, trialate, white, with a rasplike surface, a dark brown nucleus of two whorls, and five subsequent whorls, with a narrow shoulder in front of an obscure appressed suture; axial sculpture beside the three varices and the minute imbricate surface includes a nodulous rib between each pair of varices; the latter are slightly recurved with a prominent spinosity at the shoulder, about six major the same number of minor, and numerous smaller imbricate intercalary riblets in the last varix, which extends nearly to the end of the long closed canal; aperture ovate, white, simple, entire; operculum normal, brown; height of shell, 62; of last whorl, 47; of aperture, 12; maximum diameter, including the varix, 27 mm. U. S. Nat. Mus. Cat. No. 160500.

Type-locality.—San Pedro, California; collected by Mrs. Oldroyd.

PURPURA NUTTALLII Conrad, 1838.

There are two color varieties which seem worthy of distinction, one completely white or yellowish white, which may take the name of *P. nuttallii albescens*, and another, which, generally preserving the usual brownish color, has a broad white band, making it very conspicuous, about the middle of the shell, and one on the canal, which may be called *P. nuttallii albofasciata.* These color-varieties appear to be unusually constant and are found chiefly in the southern range of the species from San Pedro, California, to Scammon Lagoon, Lower California. The specimens which may be regarded as types bear the museum catalogue numbers 252894 and 181827, respectively, and were collected by W. L. Chambers at San Pedro and by Henry Hemphill at San Diego, California.

TRITONALIA GRACILLIMA, new variety OBESA.

Tritonalia gracillima, var. *obesa* (Stearns MS.) in collection.

Shell resembling *T. gracillima* in most respects but notably wider. The coloration is yellowish, with brown flecks, especially on the prominences. The canal is closed. The aperture is bluish white, with four strong denticles on the anterior two-thirds of the inner lip. Height of shell, 19; of aperture and canal, 8; diameter, 7.5 mm. U. S. Nat. Mus. Cat. No. 228722.

Type-locality.—Laguna Beach, California; received from C. F. Baker.

TRITONALIA LURIDA Middendorff, new variety ROTUNDA.

Shell small, short, much inflated, solid, with four or more whorls, the apex eroded; suture appressed, obscure; axial sculpture incremental, irregular, sometimes rising to lamellae, forming pits in the interspaces of the spiral sculpture; the latter comprises (on the penultimate whorl 5 or 6, on the last whorl about 14) strong, elevated, blackish brown, more or less undulated and transversely striated squarish ribs with narrower interspaces, covering the whole whorl; aperture ovate, purplish when fresh, fading to light pink in the cabinet; outer lip strong, crenate by the sculpture, internally thickened and with six prominent denticles; inner lip erased, pillar short; canal very short, but distinctly recurved; height of shell, 16.5; of aperture, 12.5; diameter, 13 mm. U. S. Nat. Mus. Cat. No. 208495.

Type-locality.—Moss Beach, Halfmoon Bay, California; collected by F. L. Button.

TRITONALIA FUSCONOTATA, new species.

Shell solid, light yellow brown, with spiral bands of dark brown spots between the ribs, usually one at the periphery and another at each end of the whorl, but sometimes missing; whorls four or five exclusive of the (lost) nucleus, rather inflated; suture distinct, constricted, the whorl in front of it appressed and gathered into short, minute, vertical wrinkles; axial sculpture otherwise of six or seven prominent vertical ribs extending across the whorls and rather sharp elevated incremental lines; spiral sculpture of (on the last whorl about 24) subequal spiral cords with narrower channelled interspaces, covering the whorl; aperture rather wide, white; outer lip somewhat expanded, internally denticulate; body and pillar erased; canal short, closed in the adult, with a marked siphonal fasciole;

height of shell, 26; of last whorl, 20; diameter, 15 mm. U. S. Nat. Mus. Cat. No. 46729.

Type-locality.—Monterey, California, Stearns.

TRITONALIA CIRCUMTEXTA, new variety CITRICA.

This is a variety which, when fresh, presents a ground color of lemon or orange yellow instead of the usual grayish white, while the brown bands are much less emphatic and the shells are usually smaller than those of the type. Museum specimens, number 56747 from Catalina Island, may be regarded as the types.

TRITONALIA INTERFOSSA, new variety CLATHRATA.

This is a short and stout form with very prominent rectangular clathration and flatly turrited spire, which was distinguished by Dr. R. E. C. Stearns in manuscript many years ago but never published. The specimen from Avalon, Catalina Island, numbered 177995 in the museum series, may be taken as type. Height, 13; diameter, 7 mm.

TRITONALIA INTERFOSSA, new variety MINOR.

This is a pale dwarf, slender form, also from Catalina Island, number 56912, which seems nevertheless to have reached maturity. It is strongly clathrate and measures in height 7, and in diameter 3.5 mm.

TRITONALIA INTERFOSSA, new variety ATROPURPUREA.

This form resembles *clathrata,* but is more elongated and much less distinctly turrited. The color when fresh is a purplish black, which, however, fades in the cabinet to a more or less ruddy brown, after some years. It was discriminated in manuscript half a century ago by Dr. P. P. Carpenter, and has been sent out by that name to collectors, but so far as I know has not yet been published.

Specimens from Neeah Bay, Washington, numbered 155286 in the museum collection, may serve as types. Height, 19; diameter, 7 mm.

TRITONALIA SCLERA, new species.

Shell of moderate size, yellowish, flushed with more or less dark brown, with six well-rounded whorls exclusive of the (lost) nucleus; suture obscure, undulated; axial sculpture of (on the last whorl 8, on the penultimate whorl 10) low inconspicuous rounded ribs extending more or less distinctly to the canal with continually wider interspaces; also low sharp incremental lines minutely imbricating the whole sculpture; spiral sculpture of (on the penultimate whorl about 7, on the last whorl about 25) strong prominent cords with wider interspaces usually showing an intercalary thread which on the last whorl becomes nearly as strong as the others; aperture rounded, outer lip simple, periodically varicose; body erased, pillar straight; canal distinct, open, narrow, slightly recurved; height of shell, 29; of last whorl, 21.5; of aperture and canal, 15; diameter, 16 mm. U. S. Nat. Mus. Cat. No. 222569.

Type-locality.—U. S. Fish Commission station 4205, near Port Townsend, Washington; in 20 fathoms, hard bottom; temperature, 50.8° F.

The operculum is purpuroid and dark brown.

TRITONALIA EPIPHANEA, new species.

Shell small, dark brown, acute, with an angular shoulder, slender, with six whorls exclusive of the (lost) nucleus; suture distinct, slightly wrinkled and more or less appressed; spiral sculpture of (on the penultimate whorl six above and seven below the shoulder) strong equal threads with narrower interspaces, the whole slightly imbricated and covering the entire surface in a regular manner; axial sculpture of (on the last whorl seven) strong rounded ribs most prominent at the shoulder and with much wider interspaces, the spire deeply constricted at the suture; aperture oval, the outer lip thickened but not reflected, internally white with six equal and equally spaced denticulations, the body and arcuate short pillar with a layer of white enamel; the canal long, closed near the aperture, with a narrow fasciole and slightly recurved; height of shell, 25; of last whorl, 18; of aperture and canal, 13; diameter, 11 mm. U. S. Nat. Mus. Cat. No. 216809.

Type-locality.—San Pedro, California, collected by Dr. Tremper.

TRITONALIA TRACHEIA, new species.

Shell small, solid, rough, of a greenish gray color, of about five strongly shouldered whorls, the nucleus lost; the suture obscure, not appressed; axial sculpture of (on the penultimate whorl 9, on the last whorl 6 or 7) strong ribs, subspinose at the shoulder, and extending to the base; beside these there are rude incremental lines; spiral sculpture on the spire of two strong cords at the periphery, nodulous where they cross the ribs; on the last whorl below the periphery there are three strong cords with narrower deep interspaces, then a wider gap and two more on the canal; aperture subcircular, dark green, with an entire simple margin, the operculum muricoid; canal short, solidly closed, straight, with an imbricate siphonal fasciole; height of shell, 11.5; of last whorl, 8; diameter, 8 mm. U. S. Nat. Mus. Cat. No. 207084.

Type-locality.—Sitka, Alaska, in 15 fathoms, mud, dredged by W. H. Dall.

TRITONALIA TURRITA, new species.

Shell large, solid, short in proportion to its width, of four or more whorls, the apex defective; white with strong brown spiral cords; suture strongly appressed, with a whitish band in front of it, undulated by the ribs; axial sculpture of eight strong short ribs beginning at the shoulder and extending over the periphery, but stronger at the shoulder, the whorl being somewhat constricted behind them; spiral sculpture of (on the last whorl nine) strong, dark brown spiral cords, undulated by the ribs and minutely lamellose; there may be also some lesser intercalary threads; aperture rounded, outer lip much thickened, internally white with half a dozen denticulations within; inner lip white, concavely arcuate, erased; pillar short, thick; canal short, open, slightly recurved, with an obvious fasciole. Height of shell (decollate), 34; of last whorl, 28; of aperture, 20; diameter at decollation, 4; maximum diameter, 21 mm. U. S. Nat. Mus. Cat. No. 34517.

Type-locality.—San Quentin Bay, Lower California; collected by L. Belding.

Though the specimens are worn this is clearly distinct from the known species. The late Dr. R. E. C. Stearns proposed the above name but never described the shell.

Genus TROMINA Dall, 1918.

This name was proposed for the curious little shell from the Magellanic region named in 1868, by Philippi, *Fusus unicarinatus*. This has the nucleus of a *Trophon* and is probably related to the austral Trophons, but the soft parts are not known. It is more fully discussed in my paper of 1902.[1]

Genus NEPTUNEA (Bolten) Dall, 1902.

I showed in 1902 [2] while discussing the synonymy of the genus *Chrysodomus* that the latter genus was named and a type designated many years before anyone attempted to restrict and name a type for the heterogeneous collection included under the name *Neptunea* by Bolten. Herrmannsen, in 1847, correctly indicated *Trophon* (in the wide sense of that day) as the equivalent of *Neptunea* but named no type. Typical *Trophon* had been segregated by Montfort in 1810, the only other *Trophon* in Bolten's list is the type of Sars' *Boreotrophon* (*clathrus*) 1878. It is therefore obvious that *Neptunea* must be restricted to the boreal Trophons and Sars's name be relegated to synonymy, as I showed by the method of elimination in 1902.

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[1] Proc. U. S. Nat. Mus., vol. 24, No. 1264, p. 536, March, 1902.

[2] Idem, pp. 520-521.

NEPTUNEA TOLOMIA, new species.

Shell small, short, inflated, white, with an angular shoulder near the periphery on the spire, with more than four whorls (the apex defective), the suture distinct, not appressed; axial sculpture of (on the last whorl about 35) sharp ribs, regularly spaced, with wider interspaces, extending from the suture over the base; these ribs only become lamellose with senility; the canal is axially striated and the incremental lines visible; on the upper spire the intersection of the ribs and shoulder angle tends to become nodulous; aperture rounded, simple, body erased, canal narrow, a little recurved; height of shell, 19; of last whorl, 15; of aperture, 10; diameter, 10 mm. U. S. Nat. Mus. Cat. No. 222441.

Type-locality.—U. S. Fish Commission station 2896, off San Miguel Island, California, in 376 fathoms, mud; bottom temperature, 43° F.

NEPTUNEA APOLYONIS, new species.

Shell small, white, subturrited, with more than four whorls, the apex eroded, the suture distinct; axial sculpture of (on the last whorl 13 to 15) sharp low varices with wider interspaces, sometimes feebly angular at the shoulder on the spire but on the last whorl the angle is blunted or obsolete; there is no spiral sculpture and the incremental lines are not conspicuous; aperture rather wide, ovate, white, the outer lip reflected at the varices; body and pillar with a coat of white enamel; canal narrow, slightly recurved, rather long; the base of the last whorl gently constricted. Height of three whorls, 21; of last whorl, 17; diameter, 10 mm. U. S. Nat. Mus. Cat. No. 209303.

Type-locality.—U. S. Bureau of Fisheries station 4423, in the vicinity of the Santa Barbara Islands, California, in 216 to 339 fathoms, sand.

This is much like *N. tolomia* in general form but has fewer varices and no spiral cords.

NEPTUNEA ITHITOMA, new species.

Shell elongated, slender, acute, with a yellowish tinge, with eleven varices, spinose at the shoulder, with five or more whorls, the apex decorticated; suture distinct, more or less undulated by the sculpture; the varices sharp and imbricating; sculpture only of obvious incremental lines and here and there a minute vermiculation; aperture elongate-oval, outer lip thin, sharp; body erased; pillar arcuate, twisted; canal long, narrow, curved; height of shell, 38; of last whorl, 29; of aperture and canal, 25; diameter, 16 mm. U. S. Nat. Mus. Cat. No. 222623.

Type-locality.—U. S. Fish Commission station 4255, in Taiya inlet, southeastern Alaska, in 253 fathoms, rocky bottom; temperature, 36.8° F.

The operculum is dark brown and normal.

NEPTUNEA STAPHYLINA, new species.

Shell white, slender, subturrited, of five or more whorls, the apex lost; suture distinct; axial sculpture of (on the last whorl seven) sharp-edged varices, prominent only at the shoulder where they are produced into a small spine; there is no spiral sculpture except the angle at the shoulder; aperture obovate, simple; canal long, narrow, recurved; the body with a coat of enamel, the pillar very short; operculum normal; height of spire, 9; of aperture, excluding the canal, 5.5; the canal, 6.5; diameter, 8 mm. U. S. Nat. Mus. Cat. No. 209947.

Type-locality.—U. S. Fish Commission station 4415, off Santa Barbara Island, California, in 302 to 638 fathoms, mud.

NEPTUNEA CALLICERATA, new species.

Shell small, white, with a smooth nucleus of one and a half whorls and five subsequent whorls; suture distinct, not appressed; varices sharp, a spine rising nearly vertically from the shoulder, guttered and slightly recurved, nine on the penultimate, eight on the last whorl, and extending from the suture to the base; spiral sculpture of extremely close fine striation on the whorls above the base and in front of the shoulder; aperture semilunate, body erased, pillar long and attenuated; canal long, slender, slightly curved; height of shell, 16; of last whorl, 12; of aperture and canal, 9; diameter, 6 mm. U. S. Nat. Mus. Cat. No. 209914.

Type-locality.—U. S. Fish Commission station 4356, off Point Loma, California, in 120 to 131 fathoms, muddy bottom.

NEPTUNEA (TROPHONOPSIS) LASIA, new species.

Shell fusiform, slender, white, with a dingy brownish periostracum and more than five whorls, the apex defective; suture distinct, the whorls prominently rounded; axial sculpture of numerous elevated incremental lines which imbricate or nodulate the spiral sculpture at their intersections; spiral sculpture of (on the early whorls 4, on the penultimate whorl by intercalation 8, on the last whorl about 25) narrow cords with wider or subequal interspaces, increasing by intercalation until on the last whorl they become practically equal and mostly minutely imbricated; aperture ovate; outer lip thin, simple; body erased; canal long, narrow, recurved; axis minutely pervious, pillar short, gyrate; height of shell, 30; of last whorl, 24; of aperture and canal, 19; diameter, 10.5 mm. Operculum normal. U. S. Nat. Mus. Cat. No. 210087.

Type-locality.—U. S. Fish Commission station 4515, off Point Pinos, California, in 198 to 495 fathoms mud and shell.

This is closely related to *N. tenuisculpta* Carpenter.

TYPHIS LATIPENNIS, new species.

Shell large for the genus, solid, heavy, with four varices to a whorl, the tubes retractive, nearer the preceding varix, and about six whorls, the nucleus rounded, small; suture obscure, the spaces between it and the shoulder excavated; sculpture of a keel at the shoulder and lines of growth elsewhere; terminal varix wide, with a prominent retractive spine at the shoulder and the outer edge recurved; aperture ovate, entire, canal (defective) closed, not very long; height of shell (estimated), 30; of spire, 8; of aperture, 7; maximum diameter, 24 mm. U. S. Nat. Mus. Cat. No. 96653.

Type-locality.—U. S. Fish Commission station 2822, off Lower California, in 21 fathoms, sand.

Although the specimen is defective about the end of the canal, it is obviously distinct from either of the species yet described from this region.

CORALLIOPHILA STEARNSIANA, new species.

Shell large, solid, white, of about six very rapidly enlarging whorls, with an acute apex, the nucleus decorticated; suture distinct, very deep and narrow, but not channelled; axial sculpture of about 16 rounded ribs with subequal interspaces, chiefly prominent on the periphery, much obscured by the spiral sculpture and obsolete on the last half of the last whorl; spiral sculpture of (on the last whorl) in front of the suture about 15 close-set small cords not undulated by the ribs, next follow 10 or more much coarser ribs of irregular prominence with subequal interspaces carrying each an intercalary thread, all with the rasp-like lamination peculiar to the genus and extending to the verge of a narrow, axially striated umbilicus; aperture wide, rounded, the outer lip simple, the body with a lamina of white enamel, the pillar lip short, with a *Trichotropis*-like notch at its base; height of shell, 23; of last whorl, 18; of aperture, 15; diameter, 24 mm. U. S. Nat. Mus. Cat. No. 46377.

Type-locality.—Lower California; Stearns Collection.

CORALLIOPHILA (PSEUDOMUREX) KINCAIDI, new species.

Shell fusiform, dirty white, with about six shouldered whorls, the nucleus decorticated, the suture deep, very narrow; axial sculpture of nine rather sharp vertical ribs extending from the suture to the canal with wider interspaces; spiral sculpture of (on the penultimate whorl eight) strong subequal cords, with narrower deep interspaces covering the whole shell, all furnished densely with short guttered lamination as usual in the genus; aperture ovate, outer lip simple, fringed by the external sculpture, inner lip glazed with white enamel; canal rather long, bent to the left, narrow, open, with a strong laminose fasciole; height of shell, 30; of last whorl, 21; diameter, 15 mm. U. S. Nat. Mus. Cat. No. 183067.

Type-locality.—Puget Sound, Prof. Trevor Kincaid. This has somewhat the aspect of a *Tritonalia.*

CORALLIOPHILA (PSEUDOMUREX) ORCUTTIANA, new species.

Shell white with a pinkish flush in the aperture, of about six whorls, the nucleus defective, suture distinct, slightly appressed; axial sculpture of (on the last whorl 10) vertical rounded ribs extending to the canal, with equal or narrower interspaces and overrun by the spirals; spiral sculpture on the penultimate whorl of one strong peripheral cord, a secondary smaller cord on each side of it, carrying a smaller thread in the interspaces; between the suture behind and the first secondary cord are three threads and this part of the whorl is slightly flattened; on the last whorl beside the peripheral one there are about a dozen secondary cords and as many intercalary threads, all sculptured with small close-set arched lamellae; aperture rather small, outer lip striated within at certain stages, inner lip with rosy white enamel; canal long, narrow, with a well marked fasciole; height of shell, 22; of last whorl, 17; of aperture and canal, 13; diameter, 11 mm. U. S. Nat. Mus. Cat. No. 217869.

Type-locality.—Magdalena Bay, Lower California; C. R. Orcutt.

EPITONIUM (ASPEROSCALA) TINCTORIUM, new species.

Shell small, white with a narrow purple-brown spiral line in front of the suture, of six or more whorls excluding the (lost) nucleus; the whorls adjacent, the axis imperforate, with 11 to 12 continuous varices which about half encircle the spire; the varices smooth, slightly reflected, wider where they cross the rather deep suture; there are no varical angles or spines; the whorls are uniformly finely spirally striated; aperture rounded; there is no basal cord or disk; no operculum was taken with the specimen; height of shell, 7; of last whorl, 3; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 218100.

Type-locality.—Magdalena Bay, Lower California; collected by C. R. Orcutt. The colored line probably fades in time in the cabinet, like that of the Californian *tincta* Carpenter, which is a larger shell.

EPITONIUM (ASPEROSCALA) KERATIUM, new species.

Shell small, white, with 13 or 14 varices and 8 rounded whorls exclusive of the (lost) nucleus; suture distinct, axis imperforate; varices concentrically striated on the anterior face, not coronate or angular, continuous up the spire, which they about one-third encircle; spiral sculpture of, on the early whorls, fine close threads, which gradually become feeble and on the last whorl entirely absent; aperture rounded with a slight angulosity at the anterior end of the pillar lip, forming a strong wrinkled fasciole behind that lip; there is no basal disk or ring; height, 10; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 217878.

Type-locality.—Magdalena Bay, Lower California; collected by C. R. Orcutt.

EPITONIUM (ASPEROSCALA) CANNA, new species.

Shell small, white, shading to yellowish on the spire, with six whorls excluding the (lost) nucleus, imperforate, with a deep suture and six strong varices, continuous up the spire which they about one-fourth encircle; the varices are concentrically striated on the anterior face, are very solid, and have no angulation at the shoulder; spiral sculpture of on the base of the last whorl numerous minute sharp threads with intercalary fine striae occupying the wider interspaces; this sculpture becomes obsolete at or behind the periphery; there is no basal cord or disk; height, 9; maximum diameter, 5 mm. U. S. Nat. Mus. Cat. No. 218099.

Type-locality.—Magdalena Bay, Lower California; collected by C. R. Orcutt.

EPITONIUM (NITIDOSCALA) BARBARINUM, new species.

Shell small, imperforate, white, with 11 varices continuous up the spire which they one-third encircle; anterior surface of the varices flattish, smooth; the shoulder is not angular or spinose; there are six whorls exclusive of the (lost) nucleus; suture deep; base rounded without a basal cord or disk; aperture subovate, the inner lip thickened; height of shell, 19; of last whorl, 7.5; of aperture, 4; diameter, 6.5 mm. U. S. Nat. Mus. Cat. No. 46229.

Type-locality.—San Diego, California, Stearns collection.

EPITONIUM (NITIDOSCALA) PHANIUM, new species.

Shell small, white with a flesh-colored upper spire, with seven or eight nearly vertical continuous varices, and somewhat more than eight whorls, including a smooth white nucleus of two whorls; suture distinct, deep; axis imperforate; surface smooth except for faint incremental lines, the varices smooth without angles or spines; base rounded with no basal disk or cord; aperture oval, simple; height of shell, 8; of last whorl, 4; of aperture, 1.5; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 218095.

Type-locality.—Magdalena Bay, Lower California; collected by C. R. Orcutt.

EPITONIUM (NITIDOSCALA) CALLIPEPLUM, new species.

Shell small, lilac color on the spire, paling into white on the last whorl, with about eight whorls exclusive of the (lost) nucleus, imperforate; suture deep; axial sculpture of very faint incremental lines and 11 thin, low, narrow, continuous varices, dipping into the suture which encircle less than a quarter of the circumference of the spire; surface polished, aperture obliquely ovate; height of shell, 9; of last whorl, 5; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 218096.

Type-locality.—Beach at Magdalena Bay, Lower California; collected by C. R. Orcutt.

GRAPHIS SHEPARDIANA, new species.

Shell minute, slender, translucent yellowish, with about nine whorls, including the rather blunt smooth apical nucleus; suture constricted, distinct, coils of the spire rather lax; axial sculpture of minute, close-set plications which start from the suture and become feeble on the base; these are crossed by minute close spiral striae most evident near the periphery, and under the lens showing an inconspicuous reticulation; base imperforate, rounded, and somewhat produced; aperture ovate, the margin thin, not reflected, interrupted by the body, produced anteriorly; height of shell, 3.7; diameter, 1 mm. U. S. Nat. Mus. Cat. No. 107276.

Type-locality.—San Pedro, California; collected by Miss Ida Shepard, now Mrs. Oldroyd.

This shell was collected and named in 1895, but by some accident the diagnosis has remained unpublished. It may have been distributed under the generic name of *Stylopsis.*

CARINARIA LATIDENS, new species.

Animal slender and mostly translucent yellowish; the extreme tail for a short distance, the muzzle, and the liver contained chiefly in the shell, are dark purple; the crop or anterior food cavity is pinkish; the eyes very vivid black, contained in short subcylindric processes behind and a little outside of the short slender tentacles. The surface of the body is covered with small translucent acute pustules. The gills are small and protrude from the shell. The ventral fin is rounded quadrate, about one-third of the way from the muzzle to the tail. The shell and its included organs are about midway of the total length. The ventral sucker is small on the ventral and near the posterior edge of the fin. The dorsal fin halfway between the shell and the tail is lower, rounded triangular, diminishing in height backwards. The shell is small, with a minutely coiled apex, and the weight of the included organs causes the animal to swim permanently on its back. The radula is of the general type of that of *C. cristata,* but the rhachidian tooth is more than twice as wide proportionately and develops a small cusp at each anterior corner of the base—a feature not known in *C. cristata.* There are three slender laterals. Behind the eyes the body is gradually constricted forming a sort of neck. The specimen (which was figured from life) was about 150 mm. in length; its greatest diameter just behind the ventral fin about 22 mm.

Collected on the surface of the North Pacific Ocean in latitude 43° 10′ north, and longitude 147° west, by W. H. Dall, July 23, 1866.

SEGUENZIA CERTOMA, new species.

Shell small, trochiform, white, with a minute, smooth globular nucleus and seven subsequent strongly sculptured whorls; suture obscure: spiral sculpture of a small, closely beaded thread at the summit of the whorl, separated from a low, sharp carina by a wider, excavated interspace, and the latter from a more prominent peripheral carina by a still wider space; on the base are three sharp threads followed by three lower rounded threads, which approach the pillar; axial sculpture of fine, even, arcuate wrinkles, which, except where they bead the posterior thread, are chiefly visible in the interspaces; the suture is laid on the peripheral thread and between it and the outer lip at the aperture is a very deep sulcus; the outer lip is much produced and its edge modified by the external sculpture, so that there is a sulcus at the end of the peripheral keel, another at the middle of the base, and still another at the base of the pillar, which is arcuate and produced like a small plait; the base is imperforate, the body with no visible glaze; height, 5; diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 211167.

Type-locality.—U. S. Fish Commission station 4337, off Point Loma, California, in 565 to 680 fathoms, mud and gravel.

SEGUENZIA GIOVIA, new species.

Shell resembling the preceding species, but larger and differently sculptured; nucleus minute, smooth, subglobular followed by seven sculptured whorls; suture obscure, laid on the peripheral keel; spiral sculpture of four narrow prominent keels, of which the second is peripheral, the third marginates the base, and the fourth is on the base, the interspaces much wider and becoming narrower anteriorly; there are also seven closer even low threads on the base with subequal interspaces; the posterior wide interspaces are sculptured with close-set fine spiral threads; axial sculpture of numerous equal and equally spaced arcuate threads, with wide interspaces, which on the upper whorls bead the posterior carina, but later are chiefly visible in the interspaces and extend over the whole shell; the sulcus at the aperture next the body is shallow, the outer lip beyond it moderately produced and crenulate by the sculpture, the thin and arcuate pillar has a very small notch at its base, and there is a deep twisted perforate umbilicus and a thin layer of enamel on the body; height, 6; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 209228.

Type-locality.—U. S. Fish Commission station 4408, off Catalina Island, California, in 104 to 118 fathoms, sand.

SEGUENZIA CERVOLA, new species.

Shell small, white, slightly depressed, with one small, smooth nuclear whorl and five subsequent whorls flattened a little in front of a distinct suture, separated by a somewhat convex smooth fasciole from a thread-like keel above the periphery; in front of this is a wide, smooth interval; on the base are about a dozen spiral threads with wider interspaces, and very faint microscopic spiral striae are visible in all the interspaces under a lens; on the upper whorls there is a small thread between the keel and the suture, and near the apex they become obsolete; at the aperture is a shallow sulcus between the keel and the suture and a smaller one at the middle of the base; there is a sharp notch below the end of the thin, arcuate projecting pillar, behind which is a moderately large twisted umbilicus; the body shows no glaze, the base of the shell is conspicuously convex; height, 4.5; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 209229.

Type-locality.—U. S. Fish Commission station 4381, off North Coronado Island, in 618 to 692 fathoms.

SEGUENZIA CALIANA, new species.

Shell small, white, elevated, trochiform, with a minute glassy smooth nucleus and about five subsequent whorls; suture obscure, laid on the peripheral keel; spiral sculpture of, on the spire a single sharp prominent keel somewhat behind the central line between the sutures, and on the last whorl a similar peripheral keel with a wide excavated space on each side of it, the space behind the periphery wider; base with seven rather close-set squarish cords, those nearer the axis most adjacent to each other; axial sculpture of low thin sharp lamellae with wider interspaces, over riding the peripheral keel on the spire but not on the last whorl, prominent in the interspaces behind the base, retractively arcuate in the posterior interspace, and protractively arcuate in the others; they do not invade the somewhat flattish base; aperture with a very deep sulcus next the suture, the outer lip in front of it much produced, a feeble sulcus at the middle of the base, in front of the arcuate pillar a smaller rounded indentation; behind the pillar a deep groove ending in a minutely perforate umbilicus; body with no perceptible glaze; height of shell, 4.5; diameter, 3.2 mm. U. S. Nat. Mus. Cat. No. 207694.

Type-locality.—U. S. Fish Commission station 2928, off San Diego, California, in 417 fathoms sand and gravel; bottom temperature, 41° F. Also in more than 800 fathoms.

? CERITHIOPSIS SASSETTA, new species.

Shell small, slender, white with a pale olive periostracum, with more than seven whorls, the apex being eroded, the whorls moderately rounded, the suture distinct, not appressed; spiral sculpture of (on the spire four, on the last whorl five) equal and equally spaced rounded cords with more or less intercalary minute threading, on the early whorls; the anterior pair of cords are somewhat more prominent than the others; the base is disk-like, flattish, with six or more feeble spiral threads between the carinate margin and the imperforate axis; axial sculpture of (on the penultimate whorl about 17) rounded retractively arcuate riblets, with wider interspaces somewhat nodulous at intersections with the spiral cords, and becoming obsolete on the last whorl, on the spire they extend from suture to suture and on the last whorl to the base; there is also irregular incremental threading; aperture ovate, lips simple, sharp, a shallow sulcus next the anterior end of the pillar lip; height, 6.5; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 271062.

Type-locality.—U. S. Fish Commission station 4555, off Point Pino , Monterey Bay, California, in 66 to 69 fathoms, green mud.

? ALABINA CALENA, new species.

Shell small, with a very pale olivaceous periostracum, acute, slender, with about eight rounded whorls, the apex eroded; suture distinct, deep, marked by a small thread against which it is laid; spiral sculpture of (on the spire three) flattish cords with subequal channeled interspaces, on the last whorl four, the third at the periphery largest; axial sculpture on the upper spire of obscure radials which undulate the cords but do not show in the interspaces, and later are obsolete; there are also very fine silky regular incremental lines; the base is discoid, slightly flattish, imperforate, the aperture ovate, simple, the outer lip thin sharp, the inner lip white, glazed; the pillar short, thick, and attenuated, the lip beyond it produced, patulous; height, 10; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 271070.

Type-locality.—U. S. Fish Commission station 3195, off San Luis, Obispo Bay, in 252 fathoms, mud; bottom temperature, 43.2° F.

? STYLIDIUM PAGANICUM, new species.

Shell small, slender, dark reddish brown, more or less divided by paler spiral lines on the later whorls; smooth except for incremental lines, with more than six rather flattish whorls, the apex in every case eroded; suture distinct, not deep; base rounded, imperforate, the aperture ovate, the outer lip thin sharp, somewhat arcuate and produced anteriorly, inner lip erased, pillar lip slightly twisted, not thickened; operculum paucispiral; height, 8; diameter at truncation, 1.5; at base, 3 mm. U. S. Nat. Mus. Cat. No. 271078.

Type-locality.—U. S. Fish Commission station 4508, 9 miles off Point Pinos, Monterey Bay, California, in 292 to 356 fathoms, mud.

The lineate painting often shows through the shell at the inside of the aperture.

PIRENELLA CYCLUS, new species.

Shell small, white mottled with brown, probably darker when fresh, with six flattish whorls (excluding the lost nucleus) separated by a rather obscure suture; spiral sculpture of (on the spire and the upper half of the last whorl three) rows of prominent hemispherical nodules, with subequal interspaces; on the lower half of the last whorl, four undulated or obscurely nodulose flattish cords with narrower interspaces; beside these there is fine spiral threading over the surface and in the interspaces; the nodules are arranged in vertical lines above one another and give the effect of ribs, but the ribs if any are very feeble and hardly perceptible in the interspaces; base rounded, aperture rounded, the outer lip slightly thickened, not internally lirate; body and pillar with a thick coat of enamel, pillar shorter than the aperture, with a sharp siphonal sulcus behind it. Height of shell, 6.5; of last whorl, 3.5; diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 215572.

Type-locality.—Laguna Beach, California; Mrs. Ball.

CLAVA CALIFORNICA, new species.

Shell conic, slightly turrited, white with brown maculation on the spirals, or all brown, with more than six whorls (the apex defective) separated by an obscure more or less undulated suture; spiral sculpture on the spire of one strong beaded band in front of the suture and two subequal smaller ones in front of that, with narrower channeled interspaces, a narrow groove on each side of the floor of the interspace; on the rounded base are seven narrow grooves with wide flattish interspaces; last whorl suddenly enlarged with a strong rounded varix above the pillar and at the outer lip; aperture oblique, produced at the posterior commissure into a sort of channel; pillar very short, canal narrow, deep; the axis has a single sharp plait, hardly visible in the aperture but continuous up the spire, in addition to the sharp edge of the pillar; height of shell (six whorls), 28; of last whorl, 14; diameter, 13 mm. U. S. Nat. Mus. Cat. No. 264899.

Type-locality.—South end Tiburon Island, Gulf of California; Dr. Paul Bartsch. This is the first record of the genus on the west coast.

TACHYRHYNCHUS EROSUS, new variety MAJOR.

Shell resembling *T. erosus*, but much larger and coarser, of eight or more whorls, the apex as usual much eroded; suture almost appressed, rather obscure; spiral sculpture of (between periphery and suture five) channeled grooves with low flattish wider interspaces; on the flattish base there are four more, closer and diminishing toward the axis; aperture rounded, outer lip thin, deeply widely, retractively arcuate, inner lip with a glaze of enamel, pillar lip slightly thickened and at the anterior end a little produced; the interior of the aperture is smooth and there is no umbilicus. Height of (decollate) shell, 35; of last whorl, 14; diameter, 13 mm. U. S. Nat. Mus. Cat. No. 224134.

Type-locality.—U. S. Fish Commission station 3253, off the Pribilof Islands, Bering Sea, in 51 fathoms, mud; bottom temperature, 39.5° F.

? TACHYRHYNCHUS PRATOMUS, new species.

Shell small, yellowish white, acute, with a glassy swollen nucleus of about one whorl and six subsequent whorls; suture distinct, not deep, axis imperforate; early whorls moderately convex, the periphery nearer the succeeding suture, with numerous low rounded rather irregular ribs extending from suture to suture, with subequal interspaces; these ribs become gradually obsolete on the later whorls; spiral sculpture of low, irregularly distributed partially obsolete threads, with minute threadlets between them, this sculpture covers the entire whorl; base convexly regularly rounded with no umbilical depression; aperture ovate, simple, the lips sharp, with no callosities on the body; height, 10; diameter, 4mm. U. S. Nat. Mus. Cat. No. 219369.

Type-locality.—Semidi Islands, Alaska, at station 1152, in 20 fathoms, gravel, collected by W. H. Dall.

This is obviously not a typical *Tachyrhynchus*, but in the absence of the operculum and soft parts I am unwilling to refer it to a new group. It may be related to the New England *Couthouyella* or to *Bittium*.

? TACHYRHYNCHUS STEARNSII, new species.

Shell small, slender, acute, white or pale brownish, with a minute subglobular mucleus and about 10 subsequent well-rounded whorls, regularly increasing in size; suture distinct, not appressed; spiral sculpture of (on the spire three, on the last whorl four) low prominent lines about equally spaced above the base, and minute almost microscopic close-set spirals in the interspaces and on the convexly rounded base; axial sculpture not perceptible; aperture rounded, simple, the outer lip somewhat arcuate, the body thinly glazed; height of shell, 13; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 74014.

Type-locality.—San Pedro, California, Stearns Collection.

This was regarded as a new species of *Mesalia* by Doctor Carpenter, but I have always had some (perhaps unwarranted) suspicion that the shell is exotic.

TURRITELLOPSIS (ACICULA variety) STIMPSONI, new name.

> *Turritellopsis acicula* G. O. SARS, Moll. Reg. Arct. Norv., p. 186, pl. 10, fig. 14 *a—b*.; pl. 7, fig. 2 *a—e*; pl. 18, fig. 25, 1878; not of Stimpson, Shells of New England, p. 35, pl. 1, fig. 5, 1851.

A comparison of the figures of Stimpson and Sars, both elegant and accurate draftsmen, shows at once that there is a wide difference between them. *T. acicula* is more slender, with a looser coil and a much more constricted suture. It has three strong spiral cords while *T. stimpsoni* has five to seven. The west coast specimens so far obtained are of the *stimpsoni* type, which is represented in the Jeffreys collection from Lofoten, Spitsbergen, and Maine. The original *acicula* type from Grand Manan; Portland, Maine; and Newfoundland. On the Pacific side we have the *stimpsoni* from Nunivak Island; Port Etches; Shoal Bay, British Columbia and San Diego, California.

? EGLISIA NEBULOSA, new species.

Shell with the apex and outer lip defective, about seven whorls remaining, white with yellowish brown clouding, whorls regularly, increasing, well rounded, with a rather constricted suture; spiral sculpture of (on the last whorl four) small threads with narrower interspaces, in front of which are six stronger threads with at the periphery an intercalary threadlet; behind the margin of the base on the last remaining whorl there is a constriction, the margin being formed by a stout cord on which the suture is laid; the base is flattish with spiral sculpture obsolete or absent; axial sculpture of very low thin sharp varices crossing the whorl and inconspicuous incremental lines; base imperforate, aperture rounded. Height of seven whorls, 18; of last whorl, 8; diameter, 6 mm. U. S. Nat. Mus. Cat. No. 120702.

Type-locality.—Cape San Lucas, Lower California.

This was pronounced to be a new species of *Eglisia* by the late Doctor Carpenter, but it lacks the channel in front of the suture in the typical species. It looks as if it were related to *Epitonium*, and from Edgar Smith's discussion of the genus I have no doubt it belongs to that family.

Genus LITTORINA Ferussac, 1822.

Type, *L. littoralis* Linnaeus.

Section ALGARODA Dall, 1918.

Type, *L. litorea* Linnaeus.

Section LITTORIVAGA Dall, 1918.

Type, *L. sitchana* Philippi.

Subgenus MELARAPHE (Mühlfeldt) Menke, 1828.

Type, *L. neritoides* Linnaeus.

Subgenus ALGAMORDA Dall, 1918.

Type, *A. newcombiana* Hemphill.

LACUNA MARMORATA, new species.

Shell small, short, acute, dark brown (fading in the cabinet) of three or four rapidly enlarging whorls; suture distinct; surface, when unworn, with a fine spiral striation which is sometimes feeble; the last whorl has a marked keel at the margin of the base in most specimens, but this region is frequently more or less rounded, and is generally whitish with interrupted brown flecks, which painting occasionally spreads over the upper part of the whorl; a white band in front of the suture is common and on the base the white may be extended to a brown area bordering the umbilicus; height, 6; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 47081.

Type-locality.—Monterey, California.

A variety is more elevated and acute, with a more pronounced keel and narrower umbilical groove, which may take the new varietal name of *olla.* U. S. Nat. Mus. Cat. No. 216895.

Type-locality.—Olga, Washington.

This was formerly known to collectors on the Pacific coast as *Lacuna unifasciata* Carpenter, but the type-specimens of the latter in the United States National Museum (Cat. No. 60675) are more acute, elevated, and slender, pale above and below with a continuous dark brown line at the keel; exactly the reverse of the present species, which, when fresh, is dark above with a white or whitish line at the keel, broken up by brown dots or flecks.

LACUNA, new variety PUTEOLOIDES (Carpenter MS.).

This form is represented in the collection by specimens from Lobitas, California, collected by Doctor Stearns and labeled by Doctor Carpenter (No. 46984). The only difference between it and the typical *L. porrecta,* to which Doctor Carpenter allied it as a variety, appears to be a considerably narrower pillar and consequently sharper and narrower umbilical groove in the variety. As far as I am able to discover Doctor Carpenter did not publish the name.

Genus BOETICA Dall, 1918.

Shell small, solid, subconic, few whorled, umbilicate, a groove at the commissure of the outer lip and body, a shallow sulcus at the anterior end of the pillar lip, the aperture without denticulation, the lip not reflected.

Type.—Boetica vaginata Dall.

BOETICA VAGINATA Dall, 1918.

Shell small, solid, conical, white, smooth except for faint incremental lines, of about five rapidly enlarging whorls including a minute subglobular smooth nucleus; suture distinct, not deep; base rounded, aperture subovate, a distinct sharp groove in the subsutural callus, the outer lip simple, thick; the body with a thick coat of enamel curving into the concavely arcuate pillar lip; umbilicus perforate, the area bounded by a thickened spirally striated ridge parallel with the pillar lip, with the area between them excavated; at the anterior end of the pillar is a shallow, narrow sulcus, somewhat as in *Trichotropis;* height of shell, 4; of last whorl, 3; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 209891*a*.

Type-locality.—U. S. Fish Commission station 4322, off La Jolla, San Diego County, California, in 199 fathoms, shelly mud.

The exact position of this genus awaits the discovery of the operculum and soft parts.

HALOCONCHA MINOR, new species.

Shell small, purple-brownish, trochiform, with about three and a half rounded, rapidly enlarging whorls including a minute glassy nucleus; surface smooth except for incremental lines, covered with a glossy olivaceous translucent periostracum; suture distinct and deep; base rounded with a moderately wide umbilicus; aperture ovate, body with a layer of enamel connecting the two lips; height, 5.5; longer diameter, 6; shorter diameter, 5 mm. U. S. Nat. Mus. Cat. No. 215073.

Type-locality.—English Bay, St. Paul Island, Pribilof group in Bering Sea, in the laminarian zone. Collected by G. D. Hanna and various others.

This resembles *Haloconcha reflexa* Dall, of the same region, but is uniformly smaller. That species seems confined to the Pribilof Islands, but *H. minor* ranges also through the Aleutian chain and eastward as far as Chirikoff Island.

FOSSARUS ANGIOLUS, new species.

Shell small, yellowish white, with a minute globular nucleus and about four whorls; the suture distinct, not appressed; surface dull; axial sculpture none; spiral sculpture on the upper whorls two, on the last whorl six strong elevated cords, with somewhat wider channeled interspaces; umbilicus perforate, the anterior cord forming its outer boundary; aperture circular, the outer lip thickened but not reflected, the inner lip thin, sharp; height, 2.25; diameter, 1.75 mm. U. S. Nat. Mus. Cat. No. 271503.

Type-locality.—Todos Santos Bay, Lower California, near San Diego; collected by C. R. Orcutt.

FOSSARUS LUCANUS, new species.

Shell small, whitish, depressed, with a very minute brown nucleus and about two and a half subsequent whorls, the last much the largest; suture distinct, the upper part of the last whorl flattish; spiral sculpture of two very strong keels near the periphery, and two less prominent on the base, with wider minutely spirally threaded interspaces; the top of the whorl is similarly threaded; base moderately rounded with a wide excavation behind the pillar lip leading to a small umbilicus; aperture semicircular, outer lip showing the ends of the keels, pillar lip straight; height, 1.5; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 59849.

Type-locality.—Cape San Lucas, Lower California; W. H. Dall.

Genus ISELICA Dall, 1918.

Isapis Adams, 1853, not of Westwood, 1851.

The generic name being preoccupied, I have proposed the above modification.

ISELICA OBTUSA Carpenter, new variety LAXA.

Shell much resembling *obtusa*, but having a longer and more acute spire, much feebler spiral sculpture, and the whorls more laxly coiled giving the suture a well-marked channel in adults. The color is grayish white, with a yellowish dehiscent periostracum and the umbilicus is a narrow chink, partly covered by the reflected inner lip. Height of shell, 8.5; of last whorl, 6.5; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 219754.

Type-locality.—Maple Bay, Vancouver Island; collected by Mr. Hanham; also not rare in Puget Sound.

? CITHNA ORVIETA, new species.

Shell minute, olive brown, thin, turbinate, of about three rounded whorls, the surface smooth, not polished, the suture distinct; the base convex, imperforate; the aperture subcircular, simple, a chink behind the inner lip, the peristome continuous; height, 0.75; diameter, 0.60 mm. U. S. Nat. Mus. Cat. No. 105466.

Type-locality.—San Diego, California, in sea moss at low water, Henry Hemphill. This species may perhaps be a Rissoid.

CREPIDULA ORBICULATA, new species.

Shell dextral, suborbicular, minutely concentrically wrinkled, white, covered with an olivaceous velvety periostracum; whorls about four counting the (lost) nucleus; the apex curved strongly to the right and elevated (in the type-specimen) about 4 millimeters above the basal margin; back evenly convex; interior subtranslucent white, the edge of the deck prominently produced at the left center with a deep sulcus at the left; there is no cavity under the spire between the deck and the margin; height, 26; length, 20; width, 17 mm. U. S. Nat. Mus. Cat. No. 31100.

Type-locality.—Royal Roads, Victoria, Vancouver Island, in 60 fathoms, on dead bivalve; W. J. Fisher.

This is a rather rare species of quite constant character, usually found in deep water, and ranging from Bering Sea to San Diego, California. The form of the deck approaches that of *Crepipatella.*

CRYPTONATICA SALIMBA, new species.

Shell small, smooth, except for faint incremental lines, yellowish white with a faintly darker band in front of the suture and another between the periphery and the base; with four evenly rounded whorls slightly flattened in front of a somewhat appressed suture; base rounded, the umbilicus closed by a semilunar convex mass of callus not notched above; the aperture lunate, outer lip thin, the the body callous, the pillar lip somewhat thickened; the operculum is white, porcellanous, of about two whorls; height of shell, 14; of aperture, 10; diameter, 13.5 mm. U. S. Nat. Mus. Cat. No. 209295.

Type-locality.—U. S. Fish Commission station 4423, between Santa Barbara and San Nicolas islands, California, in 216 to 339 fathoms, sand. A very neat and characteristic species, ranging from Esteros Bay to the Gulf of California in deep water.

CRYPTONATICA ALEUTICA, new species.

Natica russa Dall, Proc. Cal. Acad. Sci., vol. 5, p. 251, 1874, not of Gould, Proc. Boston Soc. Nat. Hist., vol. 7, p. 43, June, 1859.

This species was long supposed by me to be Gould's *russa*, but the fortunate recovery of Gould's type indicates that the large Aleutian species requires a name. The rhachidian tooth, like that of *Bulbus*, has a simple cusp, which establishes the subgenus founded on opercular characters.

EUSPIRA ALGIDA Gould.

Natica algida Gould, Proc. Boston Soc. Nat. Hist., vol. 3, p. 73, Nov. 1848.

The fact that Gould's species was labeled "Rio Negro" has led to the supposition that it is a South American species, but the perfect agreement of Gould's type with an Alaskan and Puget Sound shell has led me to conclude that this locality, like so many other Exploring Expedition localities, is an error. There is, however a Brazilian form, quite similar, which has added to the confusion.

EUSPIRA ACOSMITA, new species.

Shell white with a minutely spirally banded yellow brown periostracum and about four whorls, the nucleus defective; suture distinct, the whorl in front of it a little impressed; axial sculpture of fine silky incremental lines; there is no spiral sculpture; aperture semilunar, oblique, the outer lip thin, the body with a coat of enamel reflected over the umbilical region in a flat pad as in *Cryptonatica*, the pillar lip somewhat thickened; height of shell, 16; of aperture, 13; diameter, 15 mm. U. S. Nat. Mus. Cat. No. 207218.

Type-locality.—U. S. Fish Commission station 3128, off Monterey Bay, California, in 627 fathoms, mud; bottom temperature, 38.9° F.

When the operculum is known this may perhaps turn out to be a *Cryptonatica*.

EUSPIRA MONTERONA, new species.

Shell of moderate size, of a dark greenish olive color with a whitish base; whorls about five, the nucleus decorticated; the surface smooth except for faint incremental lines, the suture distinct, not appressed; base rounded, whitish, the umbilicus narrow, filled below with enamel with a minute perforation above forming a notch-like gap between the white enamel of the inner lip and that of the umbilicus; outer lip thin, sharp; body with a thick coat of enamel, pillar lip much thickened, white; operculum dark brown, of about two whorls: height 19; diameter 18 mm. U. S. Nat. Mus. Cat. No. 220856.

Type-locality.—Station 1199, Captains Bay, Unalaska, in 75 fathoms, mud and gravel; W. H. Dall.

EUSPIRA POLITIANA, new species.

Shell small, white, covered with a pale brown dehiscent periostracum; whorls four and a half, the nucleus decorticated, the specimen probably not quite adult; axial sculpture of retractively radiating grooves from the edge of a channeled suture nearly to one-fifth of the arch of the whorl, with wider interspaces, and faint incremental lines; there is no spiral sculpture; aperture ovate, outer lip thin, sharp, inner lip with a glaze of enamel, thicker under the suture and forming a convex mass over the wholly obliterated umbilicus; pillar lip slightly reflected, the periostracum on the base paler than elsewhere: height of shell, 16; of aperture, 13; diameter, 13 mm. Operculum thin, horny, of two whorls. U. S. Nat. Mus. Cat. No. 205653.

Type-locality.—U. S. Fish Commission station 4779, off Petrel Bank, Bering Sea, in 600 fathoms, sand and pebbles.

If it were not for the umbilicus and operculum, this species might be taken for a *Natica*.

EUSPIRA CANONICA, new species.

Shell small, white under a pale yellowish periostracum, with more than four whorls, the nucleus eroded; suture distinct, narrow, almost channeled; axial sculpture of incremental lines and numerous small irregular wrinkles radiating from the suture and extending on the average about halfway to the periphery; there is no spiral sculpture; base rounded with a small perforate umbilicus partly overshadowed by a narrow reflection of enamel from the pillar lip; aperture semilunate, simple, the body, pillar, and posterior commissure with a liberal coating of enamel; height of shell, 8; of aperture, 5; diameter, 7 mm. U. S. Nat. Mus. Cat. No. 209411.

Type-locality.—U. S. Fish Commission station 2923, off San Diego, California, in 822 fathoms, green mud; bottom temperature, 39° F.

RUMA SUBFUSCA, new species.

Natica fusca CARPENTER, 1864 (name only), not of Blainville, 1825.

Shell depressed conic, fuscous or livid above, whitish below, the wide umbilicus deeply fuscous stained, the aperture deep livid brownish; nucleus minute, glassy, of about two depressed whorls, followed by three strongly appressed subsequent turns; periostracum thin, dehiscent, brownish; sculpture of fine faint incremental, and still fainter obsolete spiral striae; aperture very oblique, body with a heavy white callus, umbilicus wide, funicular, with a brown slightly convex marginal band; height, 31; height of aperture, 27; diameter, 24 mm. U. S. Nat. Mus. Cat. No. 46544.

Type-locality.—Panama, Thomas Bridges.

This species has generally been circulated under the name of *R. otis* Broderip and Sowerby, but that designation has been used to cover a number of probably distinct forms.

SINUM PAZIANUM, new species.

Shell small, grayish white, depressed, with a translucent smooth nucleus of a whorl and a half and two subsequent whorls; suture distinct, outline oval, axial sculpture of faint incremental lines; spiral sculpture of fine incised lines, sometimes close, sometimes with wide interspaces, but barely perceptible except with a lens; last whorl produced, body with a slight glaze of enamel; pillar lip reflected with an umbilical chink behind the reflection, base slightly flattened; longer diameter, 9; shorter diameter, 7; height, 2.5 mm. U. S. Nat. Mus. Cat. No. 211406.

Type-locality.—U. S. Fish Commission station 2823, off La Paz, Lower California, in 26½ fathoms, shelly bottom.

This is next to the smallest of the group on the Pacific coast and ranges from Catalina Island, California, to Panama, usually in deeper water.

SINUM KERATIUM, new species.

Shell small, white, convex, suborbicular, with a minute subglobular nucleus and three subsequent whorls; suture distinct and deep; spiral sculpture of sharp, rather regular grooves with wider interspaces crossed by fine incremental lines, which in places give a punctate effect to the grooves under the lens; the grooves on the base closer and finer; pillar lip slightly reflected over an umbilical chink, body with a thin glaze; long diameter, 6.5; shorter diameter, 5; height, 3.5 mm. U. S. Nat. Mus. Cat. No. 206152.

Type-locality.—Catalina Island, California; collected by W. H. Dall.

This is the smallest Pacific coast species, relatively more convex, and more regularly sculptured than the preceding.

ELACHISINA, new genus.

Shell minute, elevated, with naticoid spiral sculpture, umbilicate.

Type.—*Elachisina grippi* Dall, new species.

ELACHISINA GRIPPI, new species.

Shell minute, having somewhat the aspect of a short *Cingula*, white, with a very thin periostracum, and four well-rounded whorls, exclusive of a small glassy subglobular slightly depressed nucleus; the suture constricted but hardly appressed; spiral sculpture of fine uniform striae with slightly wider interspaces, covering the whole shell; aperture subovate, the outer lip thin, the body with a continuous coat of enamel, the pillar arcuate; the umbilicus naticoid, narrow, twisted, with an internal spiral ridge. Operculum? Height of shell, 3; of last whorl 2; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 250230.

Type-locality.—Off San Diego, California, outside the kelp line, in 16 to 20 fathoms, C. W. Gripp.

The true place of the shell is in doubt. It most recalls a minute littoriniform *Eunaticina*.

VELUTINA GRANULATA, new species.

Shell small, white, naticoid, covered with a thin yellowish dehiscent periostracum, with a minute smooth nuclear and three subsequent rounded rapidly expanding whorls; suture distinct, not appressed; sculpture of quite evident but not elevated incremental lines and very minute granulation over the whole surface; aperture ovate, produced, simple; axis imperforate, twisted, the pillar lip hardly thickened, slightly reflected. Height, 5; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 214455.

Type-locality.—U. S. Fish Commission station 4441, off Point Pinos, Monterey Bay, California, in 35 fathoms, sand.

This species seems to bridge the gap between species like *V. conica* Dall and the more encoiled Lamellarias as far as the shell is concerned.

TORELLIA AMMONIA, new species.

Shell large, cartilaginous or leathery, depressed, brown, of somewhat more than two whorls; the nucleus, comprising a little more than one whorl, has spiral elevated lamellae with wider interspaces, much as in the larval envelopes of *Lamellaria*, but on a larger scale; the remainder of the shell has close-set axial fringed lamellae; the suture is deep, the aperture entire, wider than high; the umbilicus is pervious, moderately wide, as in *Planorbis trivolvis*, the animal is distinctly Velutinoid, and carries no operculum. Height of dry shell, 12; greatest diameter, 24 mm. U. S. Nat. Mus. Cat. No. 111367.

Type-locality.—Southwest of Sannakh Islands, Alaska, at U. S. Fish Commission station 3213, in 41 fathoms, sandy bottom.

TORELLIA VALLONIA, new species.

Shell small, the earlier part of it with a calcareous lining under a leathery periostracum, the latter part entirely flexible; the general form and aspect that of *Vallonia gracilicosta* on a larger and somewhat less depressed scale; the color is yellowish brown, with about four whorls, the nucleus missing, the rest of the shell with elevated axial lamellae regularly disposed with much wider interspaces; the aperture entire, with a simple, not thickened, margin; umbilicus open, moderately wide. Diameter about 4 millimeters, the height about 3 millimeters. U. S. Nat. Mus. Cat. No. 219130.

Type-locality.—Dredged in Nazan Bay, Atka Island, Aleutians, in 14 fathoms, sand; W. H. Dall.

This species is not unlike the typical species of the genus from northern Norway, but is more depressed, the whorls less rapidly enlarging and the umbilicus larger. Owing to the character of the nucleus I am led to believe that this genus is nearer to *Velutina* than to *Trichotropis*, the radula on its part showing no marked difference.

COCCULINA CASANICA, new species.

Shell small, brownish or whitish, darker toward the apex, which is at the posterior third of the shell; both slopes slightly convex, the nuclear point always eroded; sculpture near the apex minutely equally reticulate, the sculpture coarser and the radial threads more prominent than the concentric ones toward the margin; interior polished, the muscular impression perceptible but not conspicuous. Length, 5.5; width, 4.5; height, 2.25 mm. U. S. Nat. Mus. Cat. No. 222069.

Type-locality.—U. S. Fish Commission station 4245, in Kasa-an Bay, Alaska, in 95 fathoms, mud; bottom temperature, 48.9° F.

ASTRAEA (PACHYPOMA) INAEQUALIS, new variety PACIFICA.

Shell of moderate size, of a reddish color, trochiform, carinate, of more than five flattish whorls, the apex defective; the carina overhangs a somewhat obscure suture; axial sculpture of numerous (on the last whorl about 70) obliquely protractive, close-set, rounded riblets, which are cut anteriorly into segments by three rather obscure grooves; these riblets bunched in pairs and swollen, undulate the carina, giving it a somewhat stellate profile; on the base from the carina to the umbilical callus are six deep channeled grooves separated by wider interspaces, which are crossed by numerous minute lamellae; the squarish interspaces obliquely nodulous; aperture diamond-shaped, simple, body with a glaze of enamel; pillar concavely arched, white, with a callous deposit on the umbilical area behind it. Height, 25; maximum diameter, 42 mm. U. S. Nat. Mus. Cat. No. 222320.

Type-locality.—Pacific Beach, San Diego, California; Miss J. M. Cooke.

Compared with the typical *inaequale* this form is much more finely and delicately sculptured, and the whorl is notably constricted above the peripheral keel.

ASTRAEA (PACHYPOMA) BARBARENSIS, new species.

Shell of moderate size, trochiform, white, covered by a reddish-brown periostracum, with six or more flattish whorls, the nucleus defective; suture rather obscure, not appressed; axial sculpture of (on the last whorl about 30) rounded, protractively oblique ribs, with equal or wider interspaces, reaching from the suture to the periphery which they undulate; halfway from the suture to the periphery these are cut into segments by three deeply incised grooves; there may be, near the periphery, a few intercalary short ribs; there are also fine, close, inconspicuous incremental lines; on the base inside the undulate border are five strong regularly beaded cords with narrower channeled interspaces; aperture subquadrate, the upper part of the outer lip much produced; the body glazed, the pillar concavely arcuate, ending in a blunt projection, behind it a porcellanous white semilunar callus around the imperforate umbilical depression; height of shell, 26; of aperture, 12; diameter, 37 mm. U. S. Nat. Mus. Cat. No. 223819.

Type-locality.—U. S. Fish Commission station 2945, off Santa Cruz Island of the Santa Barbara group, California, in 30 fathoms, gravel, bottom temperature 56° F.

The operculum, blackish brown inside, of about two whorls, resembles that of *P. inequale*, but is more slender and somewhat concave.

ASTRAEA (PACHYPOMA) SPIRATA Dall.

Pachypoma inaequale var. *spiratum* DALL, Nautilus, vol. 24, p. 111, 1911.

Shell trochiform, elevated, solid, of a reddish color with nacreous substratum, of more than six carinated flattish whorls, the apex, eroded; suture obscure, slightly overhung by the carina which is blunt and undulated; axial sculpture of (on the penultimate whorl about 20) protractively oblique rounded irregular ribs extending from the suture to the edge of the carina with wider interspaces, and cut into nodules by three or four equally spaced spiral grooves; the evident, almost lamellose, retractively oblique incremental lines cross the ribs and interspaces almost at right angles; the flattish base has five sharp channeled grooves with regularly spaced wider squarish interspaces between the imperforate depressed umbilical area and the carina; aperture obliquely rhombic, simple, the body with a thin glaze, the pillar nacreous, concavely arcuate, the outer lip simple produced above; height of shell, 32; of last whorl, 19; of aperture, 11; maximum diameter, 31 mm. U. S. Nat. Mus. Cat. No. 222318.

Type-locality.—Gulf of California; Miss J. M. Cooke.

This is the most elevated and smallest of the subgenus in west American waters. The examination of a number of specimens indicates that this is a distinct species, and as the original diagnosis was very brief, a full description is now supplied.

LEPTOTHYRA JUANENSIS, new species.

Shell solid, turbinate, very dark olive, with a very minute smooth nucleus and about five well-rounded whorls; suture obscure, not appressed; spiral sculpture of (on the penultimate whorl five, on the last whorl about a dozen) strong, undulate or beaded cords with wider rather deep interspaces; axial sculpture of close, oblique, rather prominent incremental lines; aperture oblique, internally nacreous, the outer lip thin, the body with a glaze of nacre, the pillar lip concave, white, nacreous with two rather formless nodulations anteriorly; height, 8; maximum diameter, 9 mm. U. S. Nat. Mus. Cat. No. 186070.

Type-locality.—Tia Juana, Lower California, near San Diego, California; collected by J. H. Paine.

This is the least attractive and one of the largest species of the genus on the west coast north of Cape San Lucas.

Dr. Paul Bartsch has proposed the varietal name *fenestrata* for a form of *Leptothyra paucicostata*, in which, under the strong spiral sculpture, there is visible in the interspaces a certain number of raised radial threads forming a more or less evident reticulation.

LIOTIA SCITULA, new species.

Shell minute, white with flecks of brown, of about four whorls, including a very minute smooth nucleus; spire flattened, suture distinct; axial sculpture of fine incremental lines, somewhat wrinkled in front of the suture and on the last whorl developing a narrow row of beads at the suture, and crenulating on the base the margin of the umbilicus; spiral sculpture of a very prominent, minutely crenulated keel at the periphery and a smaller one on which the suture is laid; the margin of the narrow umbilicus is also thread-like; aperture rounded except where modified by the external sculpture; the body with a glaze of enamel, the pillar lip somewhat thickened; height of shell, 1; maximum diameter, 2 mm. U. S. Nat. Mus. Cat. No. 194975.

Type-locality.—U. S. Fish Commission station 2813, among the Galapagos Islands, in 40 fathoms, coral sand.

The specimen may not be entirely adult and the aperture in the full-grown shell may be modified from the above description.

MÖLLERIA DRUSIANA, new species.

Shell minute, of two and a half rapidly enlarging whorls, whitish, covered with an olivaceous periostracum; suture distinct, rather deep; whorl section circular, surface smooth except for microscopic incremental lines; base convex with a rather wide umbilicus; aperture circular, simple, sharp edged; operculum calcareous, multispiral, centrally depressed on the outer side; height, 1; larger diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 31117.

Type-locality.—Constantine Harbor, Amchitka Island, Aleutians, in seaweed at low water, W. H. Dall.

CHLOROSTOMA GALLINA, new variety UMBILICATUM.

Most of the specimens of *Chlorostoma gallina* are imperforate, some have the umbilical callus concave, forming a sort of pit, and a rare variety has an entirely open, narrow, deep umbilicus. The types of the latter are U. S. Nat. Mus. Cat. No. 152998, and while in other characters similar, are smaller than the average adult *gallina*, measuring, height 22 and diameter 25 mm. They were collected by Turrill at San Quentin Bay, Lower California. Other specimens have been found at San Diego, California.

CHLOROSTOMA BRUNNEUM, new variety FLUCTUOSUM.

The common form of *brunneum* has a nearly smooth surface or a surface affected by incremental rugosities, but there is another form rather widely spread which exhibits well-marked obliquely protractive ribs to the number of 18 or 20 on the last whorl, reaching from the suture nearly to the periphery with narrower interspaces. It is rather less elevated than the average of the typical *brunneum* and has a more depressed suture. The types of the variety are U. S. Nat. Mus. Cat. No. 60055 and come from Monterey, California.

OMPHALIUS MARIANUS, new name.

This is *O. coronatus* Pilsbry, 1889, not of C. B. Adams, 1852, and *O. turbinatus* Pease, 1869, not of A. Adams, 1851. A new name for the species being needed, the above is proposed. The *O. marianus* ranges from Santa Barbara, California, to Panama and Paita, Peru, and is U. S. Nat. Mus. Cat. No. 4033.

CALLIOSTOMA COSTATUM, new variety CAERULEUM.

Shell resembling the ordinary typical form except that the apex and part of the whorls in front of the suture are colored with bands of a brilliant mazarin blue when fresh, but which, unfortunately, fades after a few years in the cabinet. Fresh specimens have a very different aspect from the common shells carrying reddish spiral lines on a yellowish ground. Typical specimens in the National Collection come from Monterey, California, and bear the catalogue number 59808.

CALLIOSTOMA COSTATUM, new variety PICTUM.

These shells resemble the type except that on the periphery of the whorl, and sometimes on the whorl between the periphery and the preceding suture, the shell is adorned with alternating light and dark patches or clouds of color. Typical specimens come from Neeah Bay, Washington, and bear the number 12612*a*.

CALLIOSTOMA CANALICULATUM, new variety NEBULOSUM.

Shell resembling the typical form except that the whorls are painted with small brown nebulous patches in a radial fashion; specimens of this kind from San Diego, California, illustrate the variety and are numbered 159251.

CALLIOSTOMA CANALICULATUM, new variety TRANSLIRATUM.

Another variation occurs in the northern part of the range of this species, from Sitka to the Straits of Fuca, in which the channels between the yellowish spiral cords are of a dark reddish brown, giving the shell a somber appearance, much in contrast with the light straw-colored type from southern California. Specimens of the former kind are in the collection from Biorka Island, Sitka Sound, and are numbered 160558.

A dark and comparatively small form of *C. gloriosum* Dall seems to be characteristic of specimens from the southern extreme of the range of this species, especially in the vicinity of San Diego.

SOLARIELLA RHYSSA, new species.

Shell small, trochiform, translucent, with four whorls, including a smooth nucleus of a whorl and a half; suture distinct; whorl-section circular; axial sculpture of (on the last whorl 35) narrow threadlike ribs, regularly spaced, uniform, the interspaces wider; extending from the suture to the verge of the umbilicus; spiral sculpture of minute spiral threads showing in the interspaces under a lens, but not modifying the axial ribs; umbilicus wide, funicular; aperture circular, simple, sharp edged; operculum brown, multispiral, horny; height, 1.7; longer diameter, 2 mm. U. S. Nat. Mus. Cat. No. 173803.

Type-locality.—Catalina Channel, California; collected by Prof. F. W. Kelsey. This shell is probably not quite adult.

SOLARIELLA TAVERNIA, new species.

Shell small, white, with a subglobular nucleus and three and a half subsequent whorls; suture distinct, deep; spiral sculpture on the spire of four or five equally distributed and subequal small threads with wider interspaces and a narrow flattish space in front of the suture; intercalary threads appear on the penultimate whorl and on the first half of the last whorl they become numerous, covering the whole surface uniformly, but a little coarser on the verge of the umbilicus which is moderately wide and deep; this sculpture becomes obsolete and the last quarter of the last whorl is perfectly smooth and polished; axial sculpture of numerous retractively arcuate threads beginning at the suture and extending feebly to the periphery on the upper part of the spire, later becoming obsolete; base rounded, aperature subcircular, simple, sharp, the lips connected by a glaze on the body and not reflected; height, 3; greater diameter, 4 mm. U. S. Nat. Mus. Cat. No. 207625.

Type-locality.—Galapagos Islands, in 634 fathoms, sand; bottom temperature, 40° F.

SOLARIELLA (SOLARICIDA) HONDOENSIS, new species.

Shell of moderate size with six moderately inflated whorls, the nucleus lost, the color olivaceous, the suture distinct, not appressed; spiral sculpture of (on the upper whorls two, on the last two whorls three) sharp threads behind the periphery raised into rather sharp nodules at the intersections with the axial threads, and with wide interspaces between the suture, each other and the following threads, the first of which on which the suture is laid and three similar threads on the base are minutely beaded, while the last, at the verge of the funnel shaped axially striated deep umbilicus is more coarsely beaded; axial sculpture of fine sharp threads more or less obsolete in the interspaces but forming nodules at the intersections and between them finer sharp close threadlets; not nodulating the posterior spirals; base convex, aperture rounded, the pillar and outer lip continuous thin and sharp, the inner lip erased, pearly; operculum thin, multispiral; height of shell, 19; maximum diameter, 17 mm. U. S. Nat. Mus. Cat. No. 205778.

Type-locality.—U. S. Bureau of Fisheries station 4974, off Hondo, Japan; in 905 fathoms, mud; bottom temperature 36.6° F.

SOLARIELLA DIOMEDEA, new species.

Shell small, white with pinkish brown touches on the prominences and four or five brown radial flecks on the spire; whorls five exclusive of the glassy subglobular nucleus, flattened in front of the suture, otherwise well rounded; spiral sculpture on and near the periphery of five or six subequal cords with narrower interspaces; on the base are about eight finer closer threads extending to the verge of the funicular umbilicus within which are four stoutly beaded strong cords diminishing in strength inward; axial sculpture of numerous fine equal regularly spaced threads with wider interspaces, beading the posterior spiral and conspicuous on the flattish part of the whorl; aperture circular, hardly interrupted at the body, the margin thin, crenulated by the sculpture; operculum multispiral, concave, translucent; height of shell, 4; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 194971.

Type-locality.—U. S. Fish Commission station 2813, at the Galapagos Islands, in 41 fathoms, coral sand.

This though much smaller, belongs to the type of *S. peramabilis* Carpenter.

SOLARIELLA NYSSONA, new species.

Shell small, white, prickly, with six well rounded whorls exclusive of the one-whorled glassy very minute nucleus; suture deep, almost channeled; spiral sculpture of a prominent line of sharp nodules at the shoulder of the whorl in front of which, between it and the base, are three widely spaced threads similarly but less prominently nodulate at intersections with the axial sculpture and with one or two fine intercalary threads in the much wider interspaces; on the base are four or more equal small beaded threads with wider interspaces to the verge of the funicular umbilicus which is marked by one or two rows of prominent sharp nodules; internally the umbilicus is axially striated; axial sculpture of numerous sharp, widely spaced, often broken, elevated lines sharply nodulose at the intersections; aperture subcircular, the margin thin, sharp, hardly interrupted by the body. Height, 6; diameter, 7.5 mm. U. S. Nat Mus. Cat. No. 205799.

Type-locality.—U. S. Bureau of Fisheries station 3738, off Hondo, Japan, in 167 fathoms, mud; bottom temperature, 67° F.

SOLARIELLA DELICATA, new species.

Shell small, white, with about four well rounded whorls exclusive of the rather prominent minute glassy nucleus; suture distinct, almost appressed; spiral sculpture of a prominent thread at the shoulder, two with an intercalary smaller thread at the verge of the umbilicus and numerous feeble minute elevated lines under-running the axial sculpture; umbilicus narrow, deep; axial sculpture of very numerous, equal, regularly spaced low lamellae, with (on the last whorl) about equal interspaces, extending to the verge of the umbilicus and minutely beading the shoulder cord; aperture circular, hardly interrupted by the body, the margins thin and sharp; height, 7; diameter-6.5 mm. U. S. Nat. Mus. Cat. No. 205780.

Type-locality.—U. S. Bureau of Fisheries station 5050, near Hakodate, Japan, in 266 fathoms, sand; bottom temperature, 37.9° F.

This is one of the most elegant species of this very beautiful genus.

SOLARIELLA KOREANICA, new species.

Shell small, white, with four well rounded whorls exclusive of the minute glassy nucleus, and a distinct not appressed suture; spiral sculpture of a feeble thread at the base and two stronger, rather widely separated, sharper threads around the narrow umbilicus; spiral sculpture of (on the last whorl about 25) obliquely retractive low folds which barely reach the periphery, with narrower interspaces, but are feebly and irregularly revived on the base, especially near the umbilicus; aperture subcircular, hardly interrupted by the body, with a sharp thin margin; height, 5; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 205783.

Type-locality.—U. S. Bureau of Fisheries station 4852, off the coast of Korea (Chosen) in 568 fathoms, mud; bottom temperature, 36.6° F.

MARGARITES PAUPERCULUS, new species.

Shell coarse, usually more or less eroded, of a yellowish white over a brilliant nacre, with five or more moderately rounded whorls, the nucleus eroded; suture distinct, not appressed; axial sculpture of numerous somewhat irregular narrow close-set wrinkles, extending over the whorl from the suture to the verge of the funicular umbilicus; spiral sculpture of a few spiral lines near the umbilicus; aperture subcircular, oblique, produced above, the lips joined over the body by a layer of enamel; the operculum dark brown, multispiral, with 8 or 10 turns; height of shell, 9.5; of aperture, 4.5; maximum diameter, 11 mm. U. S. Nat. Mus. Cat. No. 109457.

Type-locality.—Arctic Ocean, north of Bering Strait; collected by Capt. E. Everett Smith.

MARGARITES (PUPILLARIA) KAMCHATICUS, new species.

Shell large, solid, ashy gray, somewhat depressed, with six whorls exclusive of the (lost) nucleus; suture distinct, not appressed; axial sculpture of radiating threads near the apex, soon becoming obsolete and reduced on the last three whorls to somewhat rude incremental lines, slightly sharper and more regular on the base; spiral sculpture of two close and one larger peripheral cord between the sutures on the spire, on the last whorl these occupy the posterior half of the space between the suture and the periphery; in front of them is a space without spiral sculpture reaching to the periphery; on the base between the periphery and the verge of the umbilicus there are about a dozen spiral uniform threads with wider interspaces decussated only by the lines of growth; the interior of the rather wide umbilicus is axially striated; the periphery is rounded; aperture oblique, subquadrate, the margins thin, the body with a thin layer of nacre; the pillar is slightly concavely arcuate. Height of shell, 23; of last whorl, 18; diameter, 27 mm. U. S. Nat. Mus. Cat. No. 210275.

Type-locality.—U. S. Bureau of Fisheries station 3643, on the southeast coast of Kamchatka, in 100 fathoms sand; bottom temperature, 31.7° F.

MARGARITES (PUPILLARIA) HEALYI, new species.

Shell large, livid yellowish white, with a thin very pale periostracum and about six whorls including a smooth white turbinate nucleus of two moderately rounded whorls; suture distinct, not appressed, the whorls between not inflated; axial sculpture of oblique quite evident incremental lines, occasionally developed into minute wrinkles; spiral sculpture of rather irregularly spaced low threads, about a dozen on the penultimate whorl, with wider interspaces; especially near the periphery on the spire; on the last whorl, including the base, they are more numerous and closer; base slightly flattened with a narrow, perforate umbilicus; aperture oblique; simple, nacreous; body with a coat of enamel; pillar straight, slightly callous, with no projection at the base; height of shell, 20.5; of last whorl, 15; maximum diameter, 20 mm. U. S. Nat. Mus. Cat. No. 223801.

Type-locality.—Arctic Ocean, north of Bering Strait, station 10, of U. S. S. *Corwin*, Capt. M. Healy.

MARGARITES (PUPILLARIA) SHANNONICUS, new species.

Shell large, thin, gray, with a dull surface, trochiform, with a minutely glassy globular nucleus and five subsequent whorls, suture distinct, deep; axial sculpture of prominent, almost lamellose close-set incremental lines, which near the apex of the shell develop as stronger wrinkles; spiral sculpture of (on the penultimate whorl four, on the last whorl between the suture and the base five or more) low keels, with much wider interspaces and occasional intercalary threads; just over the edge of the base and around the deep rather narrow umbilicus are other fine threads with a more or less smooth space between the two groups; aperture rounded, outer lip somewhat produced above, pearly, with a thin layer of enamel across the body; pillar lip thin, hardly reflected; larger diameter, 14; shorter diameter, 11.5; height, 13 mm. Operculum whitish, of about 10 turns, fringed externally at the suture. U. S. Nat. Mus. Cat. No. 219265.

Type-locality.—Shannon Fiord, East Greenland, Doctor Pansch.

This recalls *M. striatus* Broderip and Sowerby, but is a thinner and more delicate shell with quite different minor characters. The ovicapsules attached by the base to the specimens are discoid and appear to hold only one or two eggs.

MARGARITES (PUPILLARIA) RUDIS, new species.

Shell of moderate size, white, with a pale olivaceous periostracum, a smooth nucleus of about one whorl and five subsequent whorls; spiral sculpture of two strong cords with wider interspaces and a third on which the suture is laid and which forms the margin of the base; there is also a small thread between the suture and the posterior cord and on the last whorl a similar thread in the interspaces; on the base there are six or seven smaller closer cords separated by obscurely channeled interspaces between the verge of a narrow umbilicus and the basal margin; axial sculpture of (on the penultimate whorl about 20) retractive riblets extending from suture to periphery, with wider interspaces, slightly nodulous at the intersections with the spiral cords; there are also close obvious incremental regular lines over the whole surface; aperture rounded quadrate, simple, a glaze on the body, the pillar lip slightly thickened; operculum multispiral. Height, 12; diameter, 12.5 mm. U. S. Nat. Mus. Cat. No. 213951.

Type-locality.—Coal Harbor, Shumagins, Alaska, in 8 fathoms, mud; collected by W. H. Dall. Also Arctic and Kamchatka coasts.

MARGARITES (PUPILLARIA) ROSSICA, new species.

Shell large, solid, trochiform, of a pale gray color over a brilliant nacre; whorls eight, including a small pinkish nucleus of two whorls; spiral sculpture of (on the spire three) strong blunt keels, of which two near the periphery are the most prominent, with subequal wide interspaces; there is a fourth less prominent one on which the suture is laid which only shows on the last whorl; on the base there are about 10 smaller cords irregularly spaced; axis perforate by a narrow twisted umbilicus; axial sculpture of very fine close uniform sharp incremental lines; aperture rounded-quadrate, simple; outer lip thin, sharp, undulated by the sculpture; body lightly glazed; pillar lip slightly tortuous, hardly thickened, with a slight angle at the anterior end; height of shell, 32; of last whorl, 22; maximum diameter, 30 mm. U. S. Nat. Mus. Cat. No. 111046.

Type-locality.—U. S. Bureau of Fisheries station 5012, in Aniwa Bay, Sakhalin Island, in 40 fathoms, mud.

This appears to be the largest and finest species of the group.

MARGARITES (LIRULARIA) INFLATULA, new name.

Margarites inflata Carpenter, Rep. Brit. Assoc. for 1863, p. 139, 1864, not of Brown (as *Trochus*) Mem. Wernerian Society, vol. 8, pl. 1, fig. 10, 1839.—Morris, Cat. Brit. Foss., ed. 2, p. 257, 1854; nor of Totten, 1834.

This species is incorrectly placed in the synonymy of *M. pupilla* Gould in Tryon's Manual. The type is from Puget Sound, collected by Dr. C. B. Kennerly. U. S. Nat. Mus. Cat. No. 4494.

MARGARITES (LIRULARIA) ALTHORPENSIS, new species.

Shell small, solid, trochiform, nacreous white, with a minute subglobular smooth nucleus and five subsequent whorls; spiral sculpture of five uniform prominent threads on the upper half of the last whorl and between the sutures on the spire, with wider interspaces; on the base the threads are more numerous, smaller and with subequal interspaces, extending from near the periphery to the umbilicus, which is perforate and not internally sculptured; axial sculpture of fine regular incremental lines not modifying the spirals; aperture rounded-quadrate, simple, sharpedged, the lips connected by a glaze on the body, not anywhere reflected; height, 3; larger diameter, 3.2 mm. U. S. Nat. Mus. Cat. No. 208559.

Type-locality.—Granite Cove, Port Althorp, Alaska, in 14 fathoms, gravel; W. H. Dall.

MARGARITES HELICINUS, new variety ELEVATUS.

Shell small, trochiform, polished, purple-brown, with a dark glassy nucleus and about five subsequent well-rounded whorls; suture distinct, rather deep; sculpture of evident incremental lines without any spiral striae; base rounded with a small umbilical chink; aperture simple, rounded, slightly angular at the suture, the body with a well-marked glaze uniting the outer lips with a rather wide, white, slightly reflected pillar lip; operculum brownish with about 10 turns; larger diameter, 9; shorter diameter, 7; height, 6.5 mm. U. S. Nat. Mus. Cat. No. 205833.

Type-locality.—Bear Bay, Baranoff Island, Alaska, collected by Mrs. Kate Stephens. This is closely related to the typical *M. helicinus*, but its form is more trochoid; it has a larger number of whorls and its aperture more nearly circular.

MARGARITES HELICINUS, new variety EXCAVATUS.

Shell small, depressed, thin, polished, lurid flesh color with a darker globular glassy nucleus, and about three subsequent whorls, on which a few spiral lines of obscurely lighter color are sometimes apparent; suture distinct, not appressed; surface with faint incremental lines as the only sculpture; base rounded with, in the adult, a widely excavated funicular umbilicus, aperture rounded, simple, more or less patulous when mature; inner lip with a moderate coat of enamel continued on to the pillar lip and slightly reflected there; larger diameter, 9; shorter diameter, 5.5; height, 3.5 mm. U. S. Nat. Mus. Cat. No. 219144.

Type-locality.—Constantine Harbor, Amchitka, Aleutian Islands, collected by W. H. Dall. Also at Middleton Island, Alaska.

MARGARITES PRIBILOFFENSIS, new species.

Shell small, solid, trochiform, pale straw color, with a small glassy nucleus and about five and a half subsequent well rounded whorls; suture distinct, slightly appressed; surface dull, with fine incremental lines crossed by extremely fine spiral striae; base well rounded with a deep, not funicular umbilicus, aperture rounded, simple, the outer lip produced at the suture and united with the pillar by a thin glaze of enamel over the body, the pillar lip a little thickened, not reflected; operculum brownish with eight or more turns; larger diameter, 8.5; shorter diameter, 7; height, 8 mm. U. S. Nat. Mus. Cat. No. 210130.

Type-locality.—U. S. Fish Commission station 3504, near the Pribilof Islands, Bering Sea, in 34 fathoms, sand; bottom temperature, 37.8° F.

This species resembles *M. marginatus* but is larger, more solid, not fluctuated, nor angular at the periphery, and with a different suture.

MARGARITES FRIGIDUS, new species.

Shell small, polished, conic, pale flesh color, of six whorls, including a minute subglobular nucleus; suture distinct, not appressed, whorls only moderately rounded; axial sculpture of faint incremental lines, spiral sculpture of a few very faint lines near the umbilical region; base rounded, imperforate; operculum pale brown with about 8 turns; aperture rounded, slightly angular above, outer lip simple sharp, body with a thin nacreous glaze, pillar lip rounded, broader than the rest; height of shell, 9; of last whorl, 6.5; of aperture, 3; diameter, 6 mm. U. S. Nat. Mus. Cat. No. 223423.

Type-locality.—Arctic Ocean north of Bering Strait; Capt. M. Healy of the U. S. R. M. steamer *Corwin.* This species occurs also as far south as Nunivak Island.

MARGARITES MARGINATUS, new species.

Shell small, thin, trochiform, pale gray or pink, with a minute glassy nucleus and about five subsequent whorls; suture distinct, rather deep, in front of it the last whorl is marginated by a series of eight or more slightly arcuate broad convex waves with narrow interspaces, extending about halfway to the periphery which is somewhat angular though not distinctly keeled; other spiral sculpture of minute almost microscopic striae over the whole surface; base moderately convex with a narrow umbilicus; aperture rounded, simple, the margin not expanded, the body with a thin layer of enamel uniting the lips, the pillar lip not reflected, slightly thickened; the operculum pale with six or more turns; larger diameter, 6.5; shorter diameter, 5; height, 5 mm. U. S. Nat. Mus. Cat. No. 109464.

Type-locality.—Adakh Island, Aleutians, collected by W. H. Dall. It has also a wide range including the Arctic Ocean in both hemispheres. The wavy margin, though always indicated, is variable in strength in different individuals.

MARGARITES HYPOLISPUS, new species.

Shell small, solid, turbinate, pale flesh color, polished, smooth, with five well rounded whorls, including a minute subglobular nucleus; suture very distinct, not appressed; base rounded with a narrow deep perforate umbilicus; aperture subcircular, simple, the pillar lip hardly thickened, the body with a thin coat of enamel; height, 3.5; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 274122.

Type-locality.—Arctic Ocean north of Bering Strait; Capt. M. Healy. This species was at first taken for the young of *M. frigidus*, but that is imperforate, more elevated, and with fewer whorls, and has less rotundity of the whorls.

? CIRCULUS ROSSELLINUS, new species.

Shell minute, white, solid, depressed turbinate, of two-and-a-half whorls, including the smooth nucleus; suture distinct; sculpture of numerous close-set spiral threads rather large for the size of the shell, crossed by microscopic incremental lines; base rounded, with a narrow deep umbilicus; aperture subcircular, the outer lip sharp, much produced above, pillar lip thickened, not reflected; height, 0.75; longer diameter, 2 mm. U. S. Nat. Mus. Cat. No. 223286.

Type-locality.—Off South Coronado Island, near San Diego, California, collected by Dr. Fred Baker, in three fathoms.

GANESA (GRANIGYRA) PIONA, new species.

Shell minute, white, of about three well-rounded whorls of which the smooth small nucleus forms one; suture deep; surface covered with a minute subgranular vermiculation, the incremental lines hardly perceptible; base evenly rounded, the umbilicus narrow; the aperture subcircular, the margin slightly thickened, not interrupted by the body; height, 2; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 207624.

Type-locality.—U. S. Fish Commission station 2808, near the Galapagos Islands, in 634 fathoms, coral sand; bottom temperature, 39.9° F.

GANESA (GRANIGYRA) FILOSA, new species.

This species is much like the preceding one but with coarser sculpture in which the elevations take the form of somewhat irregular slightly retractive very narrow folds, stronger near the suture and on the base, less conspicuous on the periphery, and with a subsculpture of revolving striae which at times roughen the threadlike folds; the shell has one more whorl than *G. piona* but in all respects except those above noted is extremely similar; the operculum is horny, subtranslucent and multispiral; height, 2.3; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 207602.

Type-locality.—This is the same as that of *G. piona.*

In her useful paper on *Cyclostrema, Adeorbis,* etc., in the Transactions of the Connecticut Academy of Sciences[1] Miss Bush proposes a new genus *Lissospira* with subordination of older names as subgenera or sections. The correct arrangement, however, would have been to accept *Ganesa* Jeffreys, 1883, as the genus, with *Granigyra* Dall, 1889, as subgenus and *Lissospira* Bush, 1897, as a section of the latter, with smooth or nongranular shell. From a smooth shell to one with granules and by coalescence of granules into vermiculation, and this into plications, is a series of steps not too difficult or important.

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[1] Vol. 10, 1897, pp. 98–144.

TEINOSTOMA (PSEUDOROTELLA) SAPIELLA, new species.

Shell minute, white, translucent, solid, of about two whorls, including a minute dark brown subglobular nucleus; suture distinct; surface glossy, smooth; last whorl only moderately enlarged and little produced at the aperture; base rounded, depressed in the center, with a pad of enamel leaving a slight chink but no perforation in the umbilical region; aperture subcircular, the outer lip thin, a thick callus on the body and a large ovate pad behind the pillar lip; height, 1; longer diameter, 2 mm. U. S. Nat. Mus. Cat. No. 127560.

Type-locality.—San Pedro, California, Mrs. Oldroyd.

TEINOSTOMA (PSEUDOROTELLA) BIBBIANA, new species.

Shell minute, very similar to the preceding, but smaller, more depressed relatively, and more transparent and thin; aperture circular, with a thinner callus on the body, and only a small linguiform pad behind the pillar lip. Height, 0.75; longer diameter, 2 mm. U. S. Nat. Cat. No. 274123.

Type-locality—San Diego, California, Mrs. Oldroyd.

TEINOSTOMA (PSEUDOROTELLA) SALVANIA, new species.

Shell small, translucent white, moderately depressed, smooth, of about three and a half whorls with a minute inflated nucleus; the only sculpture is a few faint incremental lines; base rounded, convex, imperforate, with a minute umbilical dimple, behind which is a small callus; aperture ovate, simple, the outer lip arcuate, simple, hardly produced except near the suture, with a retractive wave near the periphery; pillar thick with a small callus behind it; height, 1.2; larger diameter, 1.8 mm. U. S. Nat. Mus. Cat. No. 225190.

Type-locality—Off South Coronado Island, near San Diego, California, in 3 fathoms, Dr. Fred Baker.

TEINOSTOMA (PSEUDOROTELLA) CECINELLA, new species.

Shell small, translucent white, glassy, smooth, of two and a half depressed whorls, the suture smoothly appressed and the apex not rising above the summit of the last whorl; last whorl produced at its extremity, the umbilical region covered with a smooth pad of enamel, the aperture subcircular with thick simple lips and a slight angularity at what would be the end of the pillar if there were a pillar; height, 2; longer diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 218341.

Type-locality—Magdalena Bay, Lower California; collected by C. R. Orcutt.

SCISSURELLA CHIRICOVA, new species.

Shell small, white, trochiform, with a minute subglobular nucleus and about four and a half subsequent whorls; spiral sculpture of two sharp narrow peripheral keels, with a narrow interspace inclosing the anal sulcus and fasciole; on the outer side of each keel is a moderate constriction of the whorl; the suture is laid just below the anterior keel; there are also very minute spiral threads over the whole surface which do not reticulate the axial sculpture; the latter is composed of retractively arcuate, uniform, minute, close-set threads extending over the flattish upper surface of the whorls and the roundly convex base; axis perforate, the umbilicus small, the aperture rounded except the rather straight, somewhat reflected, short pillar lip; operculum multispiral, whitish, subtransparent; height, 2.5; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 206509.

Type-locality—U. S. Fish Commission station 3340, southeast of Chirikoff Island, Alaska, in 695 fathoms, mud; bottom temperature, 36.8° F.

SCHISMOPE CALIANA, new species.

Shell minute, translucent white, of three whorls and a minute glassy subglobular nucleus; suture distinct; last whorl with a keel halfway to the periphery, another at the periphery; half a whorl back from the aperture between these two is the oval perforation found in the genus; these interspaces are wide; a third keel is found nearer the second on the outer part of the base, and several finer ones on the base, which is funnel-shaped in the center, but forms merely a pit, the axis being imperforate; aperture wide the upper part of the outer lip protracted; the pillar lip thin, arcuate, the general form of the aperture rounded; height, 1 mm., maximum diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 198609.

Type-locality—San Diego, California, Professor Kelsey.

HALIOTIS CRACHERODII, new form IMPERFORATA.

In the Nautilus for December, 1910 (p. 96), I described a unique form of this species which is entirely imperforate, never having had any perforations, but appears normal in every other respect. While this can hardly be termed a variety it seems well to give it a name in order that it may be kept in mind by those interested in teratology of mollusca. The specimen is U. S. Nat. Mus. Cat. No. 219850, and measures 100 mm. in length by 42 in height and 95 in width, and was collected on the coast of California not far from San Pedro.

SPHENIA GLOBULA, new species.

Shell small, white, with a dehiscent brownish papery periostracum which extends beyond the shell at the siphonal end; almost spherically inflated, short, truncate behind; beaks inconspicuous, situated about the middle of the valves; anteriorly the valves are rounded, behind they are compressed into a short rostrum about one-fourth the whole length; sculpture of rather rude lines of growth, the external layer obscurely granulose, especially in front; interior of the valves chalky white, the muscular impressions distinct, the pallial sinus rounded, slightly less than half the length of the valve, its impression formed by two almost separate rather broad patches; hinge as usual in the genus. Length, 12; height, 9; diameter, 9 mm. U. S. Nat. Mus. Cat. No. 218977.

Type-locality—Baulinas Bay, California, Mrs. T. S. Oldroyd.

This is by far the most inflated and subspherical member of the genus from the west coast.

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LAND SHELLS OF THE GENUS BULIMULUS IN LOWER CALIFORNIA, WITH DESCRIPTIONS OF SEVERAL NEW SPECIES.

BY

WILLIAM HEALEY DALL,

Honorary Curator of the Department of Mollusks.

From the Proceedings of the United States National Museum, Vol. XVI, pages 639-647
(with Plates LXXI-LXXII).

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LAND SHELLS OF THE GENUS BULIMULUS IN LOWER CALIFORNIA, WITH DESCRIPTIONS OF SEVERAL NEW SPECIES.

BY
WILLIAM HEALEY DALL,
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(With Plates LXXI and LXXII.)

The peninsula of Lower California is known as the home of several interesting species of the genus *Bulimulus*, including what is, perhaps, the largest species of the genus, *B. montezuma*. As much of the peninsula, in its arid highlands, recalls the analogous districts of Peru and Chile, so the land shells, especially the *Bulimuli*, bear in their external characters the imprint of a similar environment, which has gone so far that, in one or two cases, the similar species of California and Peru have been referred to the same species. An examination of a good series shows, though this opinion proves to be mistaken, that there was reasonable ground for it in the remarkably similar effects produced by the similar environment acting upon plastic forms of the same genetic history, in the two widely separated regions. The reception of an interesting series of specimens from the California Academy of Sciences, collected by an exploring expedition sent out by them, and the attempt to name them, and simultaneously to review the species already well represented in the national collection, gradually led to the study embodied in the present paper.

The first species of the group from this region was described by Sowerby in 1833; others were named by Gould in the Boston Journal of Natural History in 1852–53. An account of most of the older species may be found in the "Land and Fresh-Water Shells of North America," Part I, by Binney and Bland, pp. 191–208, 1869. Later references to them appear in the great work by Crosse and Fischer on the land and fresh-water mollusks of Mexico, and in papers by Dr. J. G. Cooper in the proceedings of the California Academy of Sciences, second series, III, pp. 99–103, 207–217 and — —, with Pls. XIII and XIV, and also in Zoe, Vol. III, p. 11, April, 1892. The figures on the plates above mentioned are, unfortunately, not as characteristic as might be wished. There is also a short paper by the writer on *B. proteus*, in the Nautilus, of July, 1893.

Genus **BULIMULUS** Leach.

Section SCUTALUS Albers.

Bulimulus (Scutalus) pallidior Sby. (*B. vegetus* Gould.)

Normally arboreal; elevation 100–500 feet, chiefly in the southern part of the peninsula; San Jose del Cabo, Belding, Eisen; Cape St. Lucas, Xantus; Punta Arena, Bryant; Carmen Island, Stearns; Santa Margarita Island, U. S. Fish Commission; Costa Rica, Zeledon. (Plate LXXII, Figs. 2, 3.)

There is the typical form, polished and without any visible spiral striation, which varies from acute and slender ($20+40^{mm}$ and 7 whorls) to stout and short, with a larger umbilicus ($28+45^{mm}$ and 6½ whorls). It also varies a good deal in size. The specimens from Costa Rica are rather thin and the lips rather widely expanded. They agree perfectly in other respects with the Lower Californian shells.

The spiral striation in many specimens becomes pronounced and in some reaches a point comparable to the surface of the *B. montezuma.* For this variety I have used the varietal name *striatulus.* It is particularly noticeable in collections from Carmen and Margarita islands and the Gulf coast of the peninsula.

Bulimulus (Scutalus) montezuma Dall. (*B. proteus* auct. non Broderip.)

Almost confined to the mountains of the peninsula at an elevation of 2,000 to 3,500 feet (Cooper). See the Nautilus, July, 1893, p. 26. (Plate LXXII, Fig. 1.)

The variations of this species seem confined to greater or less elevation of the spire and more or less acute apical angle of the same. The specimens I have seen are more uniform in their general appearance than those of either of the other species of this region. They are never smooth, though the granules differ in prominence.

Bulimulus (Scutalus) Baileyi Dall, n. s. (*B. Xantusi* var., Stearns non Binney.)

Cape St. Lucas, W. J. Fisher and G. Eisen; Ortiz, Mexico, Vernon Bailey; Guaymas, Mexico, E. Palmer. (Plate LXXI, Fig. 1.)

Shell when perfectly fresh with a delicate brownish epidermis, which is usually lost, beneath which the shell is brownish flesh color with irregular pale streaks in harmony with the incremental lines; the margin of the whorl in front of the suture is also often whitish; dead shells are waxen or pure white, often with a ferruginous discoloration; whorls five and a half, the nucleus with a central pit or dimple at the apex, the first two turns regularly ribbed with small, sharp, rather distant ribs, the wider interspaces of which are spirally striate; subsequent whorls with close, fine, sharp, somewhat irregular wrinkles, in harmony with the incremental lines, sparser on the last whorl and crossed by fine sharp close striæ of variable strength, sometimes hardly visible, but in other specimens distinct and granulating the wrinkles; all intermediate grades are observable in comparing many specimens; suture distinct;

form like that of *pallidior* on a smaller scale, varying from moderately wide to slender; whorls rounded or moderately flattened; umbilicus small but deeper proportionately than in *pallidior;* aperture rounded ovate, the lip rather widely reflected, thin, the outer and pillar lips approximating, united by a thin wash of callus.

Measurements of a slender and a stout specimen, respectively.

	Millimeters.	*Millimeters.*
Altitude of shell	28.0	28.5
Altitude of last whorl	23.0	22.5
Altitude of aperture	15.0	16.0
Maximum breadth of aperture	11.5	12.0
Maximum breadth of shell	17.0	15.0

This species is larger than *B. Xantusi* and the latter is without a reflected lip. *B. Baileyi* has the color of *excelsus* rather than *pallidior.* Its variations, within the limits of its smaller size, are similar to those of *pallidior;* the granulation of the surface in the rougher specimens is much finer, but of the same character as that of *B. montezuma.* The species was at first confounded with *B. Xantusi*, the type of which had been mislaid, but when the latter was found and a series compared, it was obvious that they belonged to different sections of the genus. It is named in honor of Mr. Vernon Bailey, of the U. S. Department of Agriculture, who collected it in western Mexico.

Section DRYMÆUS Albers.

Bulimulus (Drymæus) californicus Reeve.

"California," Hartweg, fide Reeve; Gulf coast of Lower California, Stearns.

Only one specimem of this little-known species is in the national collection, and it unfortunately has had the pillar broken, apparently in removing the animal. It recalls *B. Liebmanni*, but is nearest to *B. serperastrus* Say, but is more slender than any specimen of *serperastrus* observed in our very large series from many localities. The peristome is reflected, especially in front, and the surface is polished.

Section MESEMBRINUS Albers.

Bulimulus (Mesembrinus) Xantusi W. G. Binney, not Cooper. (*B. Gabbii*, Crosse and Fischer.

Cape St. Lucas, Xantus (type); Rancho Lagunas, Punta Arena, near sea level, Bryant; Sierra Laguna, near La Chuperosa, altitude 2,000 feet, Eisen. (Plate LXXII, Fig. 4.)

The specimen from which Mr. Binney described the species, and which was figured to illustrate it, is in the National Collection (Mus. Reg. 9017) and must be regarded as the type. It is finely but intensely granular from the spiral striation, and agrees in every respect with the form described and figured by Crosse and Fischer in their fine work on the Mollusks of Mexico under the name of *B. Gabbii.* The lip is not reflected in any of the specimens. The specimens collected by Bryant and Eisen are of the smooth, or rather not granulated variety *levis*, which accounts for Dr. Cooper's inability to harmonize them with Binney's description and figure. The epidermis is thin and olivaceous, and Dr. Cooper reports the most perfect specimen as being streaked with brown, lighter and darker, as on *B. alternatus.*

The type of *B. Xantusi* measures 20 mm. long, 10½ mm. in greatest width, the aperture 10 by 7 mm. The smooth ones are variable in size, measuring from 18 by 10.5 to 17 by 8.5 mm. None of the specimens received from Dr. Cooper show any trace of color markings. *B. digitale*, described by Reeve (Conch. Ic., Pl. 47, Fig. 308, November 1848) without habitat, bears from the figure a very close resemblance to *B. Xantusi.*

Section **LEPTOBYRSUS** Crosse and Fischer.

The type of this section is *B. spirifer* Gabb, but from a study of the species I am satisfied that several of the other species are too closely related to be separated from *B. spirifer* sectionally, though at first sight they fail to show the characters clearly. The section contains two sets of species, which are separated by the presence or absence of the prominent lobe or flange on the pillar in the first half of the last whorl, but all the species present occasional individuals which show a ridge here, even if the majority of the conspecific specimens do not. The nuclear whorls are peculiar, and agree closely, especially in the sunken position of the extreme nucleus making a pit or dimple on the apex of the spire; the nuclear whorls have a peculiar and when unworn a very sharp and characteristic sculpture, and most of the species have an extremely similar facies, the most aberrant form being *B. artemesia*, which, however, differs only by its more numerous whorls, slender form, and the less-reflected peristome. I am confident that all these species are genetically connected, and that they should be embraced in one sectional group.

Subsection A; without prominent lamella.

Bulimulus (Leptobyrsus) artemesia W. G. Binney.

Cape St. Lucas, Xantus, 1 (type) specimen; Sierra Laguna, at 3,000 feet above the sea, 2 specimens, Eisen. (Plate LXXII, Fig. 5.)

The type is in good condition; it has eight and a half whorls, of which the first two are obtusely keeled above and the nuclear point small and sunken, forming an apical funicular pit which is quite conspicuous. The sculpture of the nucleus is like that of the other species already mentioned, of rather sparse fine, sharp riblets, with the wider interspaces more or less spirally engraved. The surface is wrinkled finely, with traces of granulation here and there on the wrinkles. The peristome is slightly reflected, and inside thickened in the manner characteristic of a shell which has passed the dry season adhering to the bark of a tree. The pillar far within the aperture shows a faint elevated ridge. Traces of epidermis on the shell are pale olivaceous yellow, the shell itself of a waxen white. It appears to be a rare species, and the furthest removed from the others which constitute the section. Yet I cannot believe that it is less related to *inscendens* (for instance) than to *B. pupiformis.*

Bulimulus (Leptobyrsus) inscendens W. G. Binney.

Cape St. Lucas, Xantus (types); Lower California, 100 to 3,000 feet above the sea, San José del Cabo, San Leonicio, etc., Eisen (typical form): Sierra Laguna, altitude 3,000 feet (smooth variety), Eisen; San José del Cabo and Punta Arena, Lower Cal. (var. *Beldingi* Cooper) Belding and Bryant. (Plate LXXII, Fig. 6.)

The type specimens of this species show the very distinct granulation due to spiral striæ, and have a nucleus like that of *B. artemesia*, obtusely keeled above. The pillar has a more or less distinct fold which, however, never becomes laminar, and is often feeble. The spiral striation may be coarse, fine, or absent, as in the species previously described. A smooth form—that is, one in which there is no spiral striation or granulation of the axially directed wrinkles, yet which has the form of the type, also occurs. Both this and the type have large shells with flattish whorls and a rather acutely conical spire. The other varieties are as follows:

Var. *alta* Dall; whorls rounder, shell shorter, last whorl 25–38, aperture 20–38 of the whole length. This form leads to var. *Beldingi.* Whorls 7½, altitude 38; maximum diameter 14 mm. Var. *monticola* Dall; more slender, smooth, compact, last whorl 23–40, aperture 17–40 of the whole length. This recalls *B. Bryanti* Cooper, but is less slender, has not the divergent last whorl, nor the laminiferous pillar. Whorls 7½, altitude 40, maximum diameter 14 mm. Var. *Beldingi*, Cooper; smaller, stouter, without spiral striation; last whorl 22–32, aperture 15–32 of the whole length. It is difficult, without a connecting series, to believe that this is not a distinct species from the typical *inscendens.* If they should be so divided hereafter, the above varieties *alta* and *monticola* would range with *Beldingi* rather than with *inscendens* proper. Whorls in the typical *Beldingi* 6½, altitude 32, maximum diameter 14 mm. The reflection of the peristome is narrower and thicker than in most of this group.

Bulimulus (Leptobyrsus) excelsus Gould, (*B. elatus* Gld, olim.)

La Paz, Xantus, Belding, Fisher. (Plate LXXII, Fig. 7.)

This is the largest, finest, and most local of the forms of this group. When fresh is streaked with waxen-white and purplish-brown and is whitish in front of the suture. It has two nuclear whorls obtusely keeled and with a less conspicuous apical pit than the others. The spiral striæ on the nucleus are often extremely faint, but can usually be made out with a magnifier on the later whorls. I have not seen any specimens where the striation was strong enough to granulate the wrinkles. While differing somewhat in form, the size is rather uniform compared with that of the other species, as might be expected from its smaller range in area and altitude. The pillar bears an observable fold, but no lamina.

Bulimulus (Leptobyrsus) Zeledoni Dall, sp. nov.

Costa Rica, Zeledon, Mus. Reg. 98231. (Plate LXXI, Fig. 2.)

Shell thin, colorless, with translucent, polished, pale yellow epidermis and seven whorls; apical pit small, the nuclear whorls rounded, the riblets upon them close set and cut by equidistant spiral grooving, so as to produce a close, even reticulation like that of close-woven cloth; apex rather pointed, whorls slightly rounded, suture distinct; surface sculptured with obscure incremental wrinkles and very faint sparse spiral striæ; last whorl more than half the length of the whole shell; base rounded, with a narrow umbilicus, over which the pillar lip is broadly reflected; aperture short, wide, peristome thin, reflected, except near the sutural commissure, the reflection becoming more marked in proportion as one passes from the suture forward, and widest of all at the pillar, which is straight, almost forming an angle with the lip at its base; body with a slight wash of callus; a slight fold at the back of the pillar, but no lamina. Longitude of shell 30, of last whorl 17, of aperture 11; maximum latitude of shell 13.5, of aperture 10 mm.

I have included this species, collected by Señor Don José Zeledon, because it does not seem to be described, and also because it seemed naturally associated with the species of Lower California, to which this article is devoted. It is easily recognized when perfect by its nuclear sculpture and simple coloration, polished epidermis, and rather wide squarish aperture.

Subsection B, with a prominent lamina projecting from the pillar in the first half of the last whorl.

This group at present comprises three species, and the internal features are essentially the same in each. About the time that the penultimate whorl is beginning to be formed the pillar becomes gyratory, so that, viewed from below, it describes a spiral curve around an imaginary cylindrical axis of greater or less diameter. After completing its round and beginning on the last whorl the outer edge of the gyre becomes thickened and expanded in a fin-like manner with thick rounded margin; the twist of the pillar becomes more nearly axial, and at the aperture of the shell shows merely as a fold or rounded ridge such as appears in the various species of subsection A.

Bulimulus (Leptobyrsus) spirifer Gabb.

"In the mountains, among rocks, from San Antonio below La Paz to near San Borja, and in the highest mountains, perhaps even farther north." Gabb. San José on the Gulf of California. Belding. (Plate LXXII, Fig. 8.)

Nearly all the specimens in the national collection were received from Gabb, so that they are authentic. The species has been confounded with others by several writers, but is clearly a distinct and well characterized form, and is the type of *Leptobyrsus*, according to the authors of that name. The species is noticeable for the oily gloss of its surface. The lamina is usually visible with difficulty or not at all from the aperture; "the prominent tooth winding inward from the columella," mentioned by Dr. Cooper,* is the fold on the pillar and not the lamina, which last he does not seem to have observed or differentiated.

The nucleus hardly differs from that of *inscendens*, the shoulder of it is rounded, not angular, and the spiral striæ are faint. The color of the shell is more brownish and less livid than in *excelsus*, the pale streaks, though frequently present, are less conspicuous, and the whitish edge of the whorl in front of the suture is less constant. The shell is the thinnest of all the species. It varies in form much like the others.

Bulimulus (Leptobyrsus) Bryanti (Cooper) Dall. *B. inscendens Bryanti* Cp. op. cit., p. 101, Pl. XIII, figs. 4 a–c, 1893.

"On dry mountains, 800 to 1,000 feet high, climbing high copal trees, northward from Cape St. Lucas, through a distance of 350 miles." Xantus, San Jose del Cabo, Bryant. (Plate LXXI, Figs. 3, 4.)

Usually white, but when living or fresh, pale-brown, showing hardly any spiral sculpture. Nucleus as in the last species. Lamina extraordinarily thick and rounded, not visible from the aperture. Surface nearly smooth but not polished; reflection of the peristome narrow and feeble.

This was referred to *inscendens* as a variety, but appears to be nearest to *spirifer* and a well-defined species.

Bulimulus (Leptobyrsus) Veseyianus Dall, sp. nov.

Espiritu Santo Id., Gulf of California. Belding. (Plate LXXI, Figs. 4, 5.)

Shell stout, inflated, brownish, polished, with seven whorls; suture appressed, distinct, but shallow; nucleus worn in all the specimens but apparently not differing from that of *B. Bryanti* except as being more blunt; whorls except the last rather rounded, the last whorl somewhat flattened at the periphery; umbilicus large but narrow, overshadowed by a very wide expansion of the pillar-lip; aperture large, the lips approximated behind, the reflection wide and greatly recurved, of a livid waxen passing into white at the margin; body moderately callous, pillar straight with an obscure fold visible at the aperture, internally with a large thick sublinguiform lamina; surface of the shell like that of *B. excelsus*, but more polished. Lon. of shell, 36.5; of last whorl, 25; of aperture, including the lip, 20; maximum diameter of shell, 20; of aperture, 15 mm.

This species is named in honor of Mr. J. Xantus de Vesey, to whom we owe much of our knowledge of the fauna of Lower California. It is recognizable by its short, stout shape, widely reflected recurved peristome, very narrow space between the commissures of the lips and body, and large subtriangular lamina. Five specimens, all very uniform, were collected by Mr. Belding (Mus. Reg., 34122) some ten years ago.

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*Proc. Cal. Acad. Sci., 2nd series, Vol. iii, p. 211, 1892.

Section ORTHOTOMIUM. Crosse and Fischer.

Bulimulus (Orthotomium) sufflatus Gould. (*B. vesicalis* Gld. olim.)

Lower California, Rich; low lands about La Paz, Gabb; San José del Cabo to La Paz, Bryant. Sierra Laguna to 3,000 feet above the sea, Eisen. Variety *insularis* Cooper, Espiritu Santo Island, Bryant. Abundant near La Paz, Belding. (Plate LXXII, Fig. 9.)

This characteristic shell has no coloration except in its epidermis, which is straw color or pale olive, intensified at lines which represent resting stages, and more or less polished. The form varies from 33.5 by 17, and 36.5 by 21 to 32 by 23 mm. The peristome is slightly reflected in front and widely over the umbilicus; elsewhere it is not reflected. In specimens which have survived a dry season attached to bark or a stone, the inside of the peristome and the space on the body between the two lips is often much thickened by a deposit of callus. The nucleus is similar to that of *Leptobyrsus*, except that the apical part is irregularly punctate, and the riblets instead of being even and sharply defined are more or less wavy and on the shoulder and earlier part give a vermicular effect. The apical pit is not conspicuous though evident in some examples. Pathologic specimens showing lumps or tubercles on the pillar are not very rare, but normally the pillar is simple. The young are frequently taken for *B. pilula* from which they may be discriminated by their projecting and more sharply sculptured nuclear whorls and less open umbilicus as well as more ovate form.

Bulimulus (Orthotomium ?) pilula W. G. Binney.

Cape St. Lucas to Margarita Island, Xantus. San José del Cabo, Bryant. The specimens collected at Punta Arena by Bryant and mentioned by Dr. Cooper are probably immature *sufflatus*. (Plate LXXII, Fig. 10.)

The types of this species in the National Museum have a distinct and mature appearance. The specimens connecting them with *sufflatus* are usually young *sufflatus*. The two types have 4 and 4½ whorls, respectively, as many as specimens of *sufflatus* four times their size. The nuclear whorls are smaller than in *sufflatus* and more delicately sculptured, while the incremental wrinkling on the body whorl is more conspicuous and regular than in the larger species. I have seen no specimens of *pilula* which appear to be genuine except the types. All the others when critically studied resolve themselves into varieties of *sufflatus*.

U. S. NATIONAL MUSEUM, *June, 1893.*

EXPLANATION OF PLATE LXXI.

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EXPLANATION OF PLATE LXXII.

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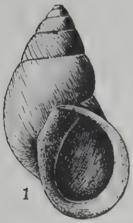

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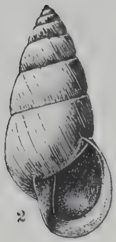

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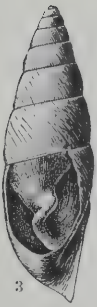

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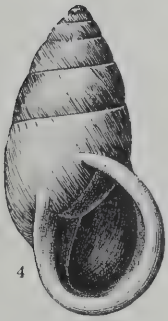

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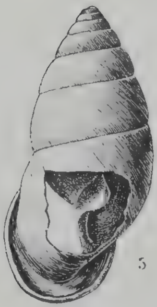

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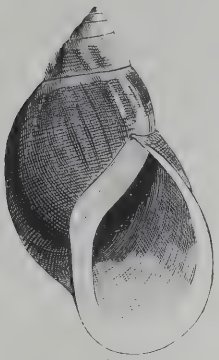
Lower Californian Bulimulus.



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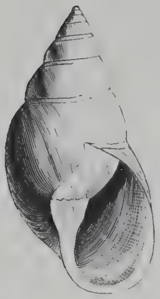

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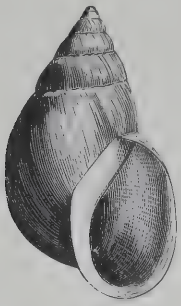

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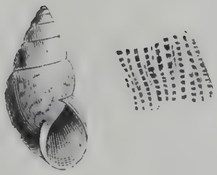

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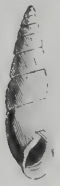

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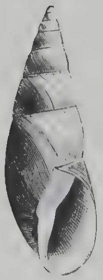

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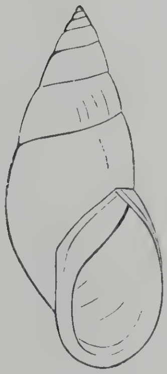

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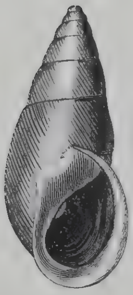

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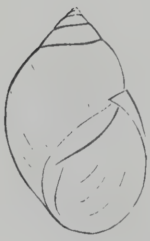

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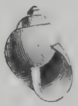

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Lower Californian Bulimulus.

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NOTES ON THE NOMENCLATURE OF THE MOLLUSKS OF THE FAMILY TURRITIDAE

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BY

WILLIAM HEALEY DALL
Honorary Curator of Mollusks, United States National Museum

No. 2238.—From the Proceedings of the United States National Museum,
Vol. 54, pages 313-333

FOR THE INCREASE AND DIFFVSION OF KNOWLEDGE AMONG MEN
PER ORBEM
SMITHSONIAN INSTITVTION
WASHINGTON 1846

Washington
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By William Healey Dall.

Honorary Curator of Mollusks, United States National Museum.

In the course of my revision of the West American mollusk fauna, the Turritidae (formerly Pleurotomidae) were reserved until nearly the last, owing to my knowledge of the extremely unsatisfactory condition of their nomenclature.

Owing chiefly to a want of thoroughness and consequent inaccuracy the recent revisions of the group by Tryon and Cossmann were quite unreliable, though to their labors in bringing material and references together and so giving a starting point for investigation I am much indebted. Furthermore several recent writers on the group have in my opinion excessively divided it, forming genera, subgenera, and sections on merely specific, or even individual, characters of no physiological or systematic importance. Of the more than 175 names of more than specific importance which have been applied to members of this family, probably not more than one third are indicative of characters of sufficient value to warrant a separate name.

Another difficulty in a satisfactory treatment of the family arises from the fact that these animals often differ among themselves anatomically in ways not expressed in the shell characters; species generically distinct sometimes having extremely similar shells. This has been amply proved in the cases of *Leucosyrinx*, *Irenosyrinx*, *Steiraxis*, and *Aforia* for instance. Therefore until much more is known of the anatomy of the species any arrangement must be merely tentative, though it is not unreasonable under the circumstances to put like shells of unknown anatomy in the same systematic group for the present.

From the recent species we must reason by analogy to determine the proper place of fossils, as no other course is open. It would require several years' work and access to European collections to place the known species and determine the synonymy of the entire family, a task beyond my powers under present conditions. I shall therefore only attempt to review our West American species, and to determine the original types and consequent characteristics of some of the more familiar genera of the family. To these data I add references to the various names which have been given to members of the group, making a basis from which later workers may be able to proceed with the review of the whole family. Some scattered names may have escaped discovery during my search, but this is a misfortune hardly to be avoided in such work. The rules by which I have been guided in recognition of valid names are those of the International Committee on Zoological Nomenclature and, while applying these rules with precision as far as the facts are known to me, I have endeavored to use in doubtful cases a rational conservatism, changing nothing for the mere love of change and avoiding the whimsicalities by means of which some recent writers have endeavored to justify their retention of familiar but unfortunately invalid names.

The Turritidae are an ancient group, originating in Mesozoic time and have naturally a world-wide distribution. There are probably more species of the family in the recent fauna than of any other family of mollusks. The distinctness of the group was recognized by Rumphius as early as 1704 and his name *Turris* with his typical species has been adopted into binomial nomenclature in its original sense, though the group has been multifariously subdivided since. It is a pity that Lamarck disregarded the work of his predecessors so far as to apply to the group a name different from that by which it had been known for nearly a century, thus necessitating an inconvenient revision nearly another century later.

Genus TURRIS Bolten, 1799.

The name *Turris* for the typical part of the genus was given by Bolten a year earlier than Lamarck's application of the name *Pleurotoma* to the same type. Still earlier, Helbling had given the name *Fusus* to a group consisting chiefly of Turritidae, but fortunately, by applying the method of elimination to his assembly, the name *Fusus* could be fixed upon a small and inconspicuous group of Gastropods, and a shifting of names which would have been practically intolerable was thus avoided. The rejection by the International Committee of the anonymous Museum Calonnianum of 1797, removes that source of confusion from consideration in systematic binomial nomenclature, though in this instance the author of that work merely followed Rumphius, and the sole identifiable species in his list is the type of *Turris* Bolten.

Link in 1807 followed Lamarck, though (possibily due to a typographical error) the name is spelled *Pleurotome* in his publication.

In the quadrinomial system of Dumeril the name is spelled *Pleurotomarius* as a designation for the animal of *Pleurotoma*. To these synonyms may probably be added *Lophiotoma and Tomopleura* Casey, 1904.

Genus CLAVATULA Lamarck, 1801.

The first subdivision of the genus was the proposal of Lamarck in 1801 of a genus *Clavatula*, which was typified by *C. coronata* Lamarck, but which is not *Clavatula* Swainson, 1840, typified by *C. sulcata* Swainson. Synonyms are *Clavicantha* Swainson, 1840, and probably the typical *Drillia* (*umbilicata*) Gray, 1838. Lamarck afterward united his *Clavatula* with *Pleurotoma*, but subsequent investigations have shown that *Clavatula*, according to its type-species, is entitled to subfamily distinction. The operculum, dentition, and anatomy are different from those of the group typified by *Turris babylonius*. It is a west African group in the main.

Genus CLAVUS Montfort, 1810.

Under the name of *Clavus* Montfort separated, in 1810, a genus typified by *C. flammulatus* Montfort, figured and described in the same place, and specifically designated as the type. Because at the same time he cited one of Lamarck's Clavatulae, the latter has been mistaken as the type. An unjustified attempt to reject *Clavus* on account of the perfectly distinct prior name of *Clava* Martyn, has been made, but Tryon correctly preserved the genus for smooth Turritidae with a short last whorl, long spire, nodulous shoulder, no spiral sculpture, a wide, deep anal sulcus adjacent to the suture and, in the completely adult, a marked subsutural callus on the body. Such species as *Pleurotoma crenularis* Reeve (Conch. Iconica, fig. 54 (not of Weinkauff), 1845; *P. lanceolata* Reeve (fig. 182), *P. maculosa* Reeve (fig. 45); and *P. echinata* Reeve (fig. 48) appear to be properly located in the genus *Clavus*.

Genus TURRICULA Schumacher, 1817.

The next to be considered is the genus *Turricula* Schumacher, 1817, based on *T. flammea* Schumacher, founded on figures 1337 and 1338, volume 4, of Martini's Conchylien Cabinet. This shell is *Turris javanus* Bolten, but not *Murex javanus* of Linnaeus and Gmelin. It is the *Murex tornatus* of Dillwyn, 1817, but not of Bolten, 1798. It is not *Clavatula flammea* Hinds, 1843.

The type of *Turricula* is an almost perfectly smooth shell of the kind ordinarily called *Surcula* H. and A. Adams, 1853, of which the type is *Murex javanus* Linnaeus and Gmelin, not Bolten. The only distinction between *Turricula* and *Surcula* is the rough sculpture of the latter. *Surcula*, if based on the adjacency of the anal sinus to the suture can only be maintained as a minor section of *Turricula.* A futile attempt has been made to reject *Turricula* on account of the use of that name in the worthless polynomial system of Klein, but that is quite inadmissible on any genuine nomenclatorial basis. The *Turricula* of Herrman, 1783, was not used in a generic sense. The *Turricula* of the Museum Calonnianum has been rejected by the International Committee on Nomenclature. The use of the name by Fabricius, 1822, and Beck, 1837, being later than Schumacher's date, need not be further considered.

Surgula Weinkauff, 1875, is a Germanized rendering of *Surcula*, but whether due to author or compositor is uncertain.

Genus MANGILIA Risso, 1826.

The next name to be considered is *Mangelia* Risso, 1826. The first species is *M. costulata* Risso, which is identical with or merely a variety of *nebula* Montagu. Risso named no type, but *costulata* was selected by Bellardi in 1847, Kobelt in 1905, and Dall in 1908. The selection of other types by authors subsequent to Bellardi has created a good deal of confusion, since Risso's group of species was not homogeneous. As has been already shown by Iredale[1] Gray, in the Proceedings of the Zoological Society of London for 1847, selected as the type of Leach's manuscript genus *Bela* this same *Murex nebula* of Montagu which makes *Bela* an exact synonym of *Mangelia*, this being the first valid publication of *Bela. Mangelia ginnania* Risso (fig. 130) to which Gray in 1847 referred the manuscript name of *Ishnula* Clark, is apparently identical with *Mangelia* s. s., though Monterosato proposed a sectional name *Ginnania* for it in 1884. *Raphitoma* Bellardi, 1844, was a heterogeneous group. Later in his preliminary synopsis of 1875, he divides the group into two sections: I, typified by *R. vulpecula* Brocchi, and II, by *R. harpula* Brocchi. In his subsequent monograph of the Pleurotomidæ he specifies (p. 323) *vulpecula* as the type of the genus. The latter is a typical *Mangelia* and *Raphitoma* therefore becomes a synonym of *Mangelia.* Other authors disregarding Bellardi's selection of a type have made extraordinary confusion of the relations of this genus.

Its chief characteristics are the absence of an operculum; the entire, hardly thickened, and nonvaricose outer lip; the unarmed pillar; and shallow anal sinus near the suture. The shell is usually axially ribbed and spirally minutely sculptured. The fact that the author intended to be honored was named Mangili led Lovèn and many subsequent writers to correct the spelling to *Mangilia*, which, as it hardly affects the location of the name in indices, though a little irregular from a nomenclatorial standpoint, may without too much reprehension be accepted.

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[1] Proc. Mal. Soc., London, vol. 11, p. 299, 1915.

Genus DRILLIA Gray, 1838.

The name *Drillia* was proposed in 1838 for a peculiar African species (*umbilicata* Gray) by J. E. Gray. What is probably the same species *Brachytoma castanea* Swainson, 1840, was one of the two types of Swainson's *Brachytoma* (not *Brachystoma*, as mispelled by several authors) and both of them probably may turn out to be Clavatulae. At any rate the shells which have been commonly called *Drillia* have to take another name.

The small blackish Drillias so common in Panamic waters, of which *Pleurotoma bottae* Valenciennes is the type, will take the name of *Crassispira* Swainson, 1840.

The light-colored species, with an oily gloss, thin shells, and prominent riblets usually crossed by rather widely spaced spiral striations, will take the new name of *Elaeocyma* Dall. This group appears to be peculiar to the Pacific coast of America. *Drillia empyrosia* Dall may be taken as type and *D. unimaculata* Sowerby, *hemphilli* Stearns, and several others belong to it.

Cymatosyrinx Dall, 1889, based on *Pleurotoma lunata* Lea, will cover the thin-shelled light-colored species of its type.

For the generally brown or brownish clathrate species a few of which are found in nearly every fauna, and of which *Pleurotoma gibbosa* Reeve may be specified as a typical example, the new name of *Clathrodrillia* Dall may be used. *Drillia ostrearum* Stearns is an American example.

Genus MELATOMA Swainson, 1840.

Swainson in 1840 described and figured under the name of *Melatoma costata* a shell which he supposed to be fluviatile but which really belonged to the Turritidae. Seven years later Gray gave the name of *Clionella* (*sinuatum* Born) to a species of the same conchological type. This group which by its dentition and operculum is related to the Clavatulae must take the earlier name.

There is a group of species typified by *Pleurotoma penicillata* Carpenter which in sculpture and periostracum closely resemble the African *Melatoma*, but their operculum has an apical nucleus and is long and narrow. They may be called *Pseudomelatoma*. *Melatoma* Anthony, 1847, is quite a different thing.

Genus MONILIOPSIS Conrad, 1865.

This name was applied in 1865 to a very beautifully sculptured species (*M. elaborata* Conrad) from the Eocene. The West American species formerly called *Surcula cancellata* Carpenter, *inermis* Carpenter, etc., though with much less elaborate ornamentation appear to be related to the Eocene fossil and may tentatively be referred to the same group. At all events they can not be comprised in *Surcula* as properly restricted. I may note that Conrad's species was very insufficiently figured by him.

Genus ANCISTROSYRINX Dall, 1881.

This group, which has a wholly superficial resemblance to *Columbarium*, is an evident development from *Cochlespira* Conrad, 1865, of the Eocene. It should be stated, however, that some wholly incongruous species have been referred to this section by authors unfamiliar with the original type, *A. elegans*, which is figured in Dr. A. Agassiz' Three Voyages of the *Blake* (vol. 2, p. 66, fig. 282, 1888). The distinctions which may serve to retain *Ancistrosyrinx* as a section of *Cochlespira* are recorded in Bulletin Museum of Comparative Zoology (vol. 43, p. 257, 1908). *Candelabrum* Dall, MS. not of Blainville, is a synonym.

Genus GEMMULA Weinkauff, 1876.

This section of *Turris* with short canal and beaded or rugose anal fasciole was named without a designated type, but, in 1896, Cossmann selected *Pleurotoma gemmata* Hinds. The section *Hemipleurotoma* Cossmann, is regarded as synonymous by Casey.

There is a numerous group of abyssal Turritidae with a sculpture somewhat like that of *Gemmula* but covered with a greenish periostracum, the shell of a chalky consistency, the outer lip thin and simple instead of internally thickened and lirate as in *Pl. gemmata*. These differences seem to be of at least sectional value and the group may be named *Cryptogemma* with *Gemmula benthina* Dall, 1908, as type. The aspect of these shells suggests relationship with *Antiplanes*, but these features may be due to similar influences of the deep-water environment. The universal erosion, even in the youngest living specimens, prevents us from knowing the nuclear characters.

Genus BELA (Leach MS.) Gray, 1847.

Iredale reviewed this genus in 1915 in the Proceedings of the Malacological Society of London, and as the type of *Bela* selected by Gray himself is the same species as the type of *Mangelia* Risso, there is no question but that the name must be abandoned.

The next name in order is *Lora* Gistel, 1848, type *Tritonium viridulum* O. Fabricius (probably=*Bela exarata* Möller). This is followed by *Oenopota* of Mörch, 1852, who designated no type. *Onopota*, H. and A. Adams, 1858, is synonymous.

Genus BATHYTOMA Harris and Burrows, 1891.

Dolichotoma Bellardi, 1875 (*Doligotoma* Weinkauff, 1876), is preoccupied by *Dolichotoma* Hope, 1839. The type is *Pleurotoma cataphracta* Brocchi, which automatically becomes the type of *Bathytoma.* This species is more or less sculptured. Casey proposed in 1904 the name of *Megasurcula* for the smoother West American species. But von Koenen in 1867[1] proposed for the *Pleurotoma filosa* of Lamarck the name *Cryptoconus;* and a comparison of it with the smaller Californian species (*stearnsiana* Raymond) shows only specific differences between them. *Cryptoconus* thus supersedes *Bathytoma* for the West American forms, whether it be accepted for the more emphatically sculptured European and West Indian species or not, and I can see no important characters to separate them.

Genus AFORIA Dall, 1889.

This name was applied by me to *Pleurotoma circinata* Dall, on the mistaken statement of Jeffreys that it possessed no operculum. Better material enabled the diagnosis to be corrected and the species would have been referred to *Leucosyrinx* were it not for the fact that a portion of the shells (males?) show in the adult a deep notch or sinus in the anterior part of the outer lip between the canal and the periphery, somewhat analogous to the sinus for the eye pedicels in *Strombus.* Whether this is a sexual character remains to be determined, but it occurs in so many specimens that it can not be regarded as abnormal.

Genus BORSONELLA Dall, 1908.

It seems entirely probable that true *Borsonia* and *Cordieria* do not exist on the Pacific coast, and that the relations between *Antiplanes* and *Borsonella* are more intimate than those with any of the European forms, notwithstanding the plait on the pillar in *Borsonella.* With Casey I think that this is a feature which may occur sporadically in a portion of any large group of Turritidae.

Genus CYTHARA Schumacher, 1817.

Cossmann states (Essais, vol. 2, p. 121) that this name was used before Schumacher, but he gives no reference and a careful search has not revealed any binomial use of it, so I am obliged to regard the statement as a mistake. *Eucythara* Fischer is a synonym. Schumacher's type, *C. striata* Schumacher, is said by several authors to be identical with *Cancellaria citharella* Lamarck, 1822. Both authors refer to the same figure of Chemnitz (1330), which represents a shell corresponding to the generally accepted type of *Cythara.*

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[1] Zittel, Traité de Pal., vol. 2, p. 284 (Barrois translation), gives 1840 the date of von Koenen's name, but I have not been able to verify this.

Some authors have confounded with this figure two adjacent figures of immature Strombi and concluded that *Cythara* was a synonym of *Strombus*, but this conclusion has no valid basis.

The typical *Cythara* is a relatively large tropical shell with short spire and narrow, elongated aperture, plentifully supplied in adults with denticulations or striated callus on both body, pillar, and outer lip. It appears to be entirely distinct from the relatively small shells, mostly with unarmed apertures, from the temperate faunas, which authors, including the writer, have been accustomed to refer to this genus. The name which we shall adopt for the small forms referred to is difficult to determine, since some of them were included in Risso's *Mangelia*, and Reeve included all he knew in his monograph of the Mangelias along with *Cythara* proper. Other authors, ignoring the real type of *Mangelia*, have applied the latter name to these species, while still others have proposed a considerable number of new names for the various species of this group. True *Cythara* appears to bear much such a conchological relation to these shells as *Glyphostoma* does to the small shells we have been accustomed to call *Clathurella*.

Cossmann in 1889 calls them *Mangilia*, following Reeve; Bellardi in 1875 had called them *Ditoma*, but this name was preoccupied by Illiger in 1807. Bellardi's type species was *Pleurotoma angusta* Jan. This is a form with a thickened outer lip, spiral striation, and conspicuous short anal sinus. Cossmann in 1889 substituted *Agathotoma*, the type, of course, remaining automatically the same; but in 1875 Monterosato had proposed for *Pleurotoma bertrandi* Payraudeau the name *Cytharella*. This covers the smooth group exactly. *Haedropleura* Monterosato, 1882, type *Murex septangularis* Montagu, would provide for the more elevated forms with few axial ribs, but the type is said to be operculate, which the true Cytharellae are not. The forms with shouldered whorls and numerous axial ribs like *angusta* Jan must take Cossmann's name, unless some anterior designation can be found. *Zetekia* is a small form recalling *Mitromorpha*, with predominantly spiral sculpture and coarse lirations on both sides of the aperture and the anal sulcus inconspicuous. The type (U. S. Nat. Mus., No. 274109) is about six millimeters long, with a smooth nucleus of about three whorls and four subsequent whorls, with the suture obscure and the color purplish brown. It was collected at Panama and I have called it *Z. denticulata*.

Genus CLATHURELLA Carpenter, 1857.

This was a new name for *Defrancia* Millet, not Bronn, 1825. In 1908[1] I discussed the synonymy of *Clathurella*, for which a species not included in Millet's original list has been usually but erroneously taken as the type. As neither Millet nor Carpenter named a type, and Carpenter's name automatically takes as type the designated species of *Defrancia* Millet (*D. pagoda*, selected by the writer in 1908), *Clathurella* must be reserved for species having the character of *D. pagoda* Millet. However, Iredale has shown that Bronn in 1831 proposed the name *Pleurotomoides* for the preoccupied *Defrancia* of Millet, which must take precedence of *Clathurella* with the same typical species. Beck proposed *Pleurotomina* as a substitute for *Defrancia* in 1847, but it had been used by Gray in 1838 as a subfamily name. This leaves the species placed in *Clathurella* by Cossmann, 1896, type *C. rava* Hinds, without a name, and among the numerous names for small Turritidae one must be sought. The earliest which seems available appears to be *Philbertia* Monterosato, 1884. The curious succession of synonyms is as follows, noting first that Bellardi did not (as has been erroneously stated) propose a name *Heterotoma*, and if he had it was preoccupied by Hartmann in 1844. Then follows *Bellardia* Bucquoy, Dautzenberg, and Dollfus, 1882, not of Mayer, 1870; *Bellardiella* Fischer, 1883 (new name for *Bellardia*), not of Tapparone Canefri earlier in 1883; *Philbertia* Monterosato (p. 132, 1884); *Cormarmondia* Monterosato (p. 135, 1884) (new name for *Bellardiella*); *Otitoma* Jousseaume, 1898; and lastly *Clathurina* Melvill (April, 1917) (new name for *Clathurella*).

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[1] Bull. Mus. Comp. Zool., vol. 43, No. 6, p. 250. On p. 261, under *Bellardiella*, the statement as to the nucleus is inaccurate and should be eliminated. The correct description is given on p. 260, line 7 *et seq.*

As far as the data are accessible to me *Philbertia* (from which the later *Comarmondia* does not materially differ) is the earliest available name for the group included by *Clathurella* Cossmann not Carpenter, and typified by *Pleurotoma bicolor* Risso=*P. purpurea* (Montagu), variety *bicolor* Bucquoy, Dautzenberg, and Dollfus+*P. philberti* Michelotti, fide Monterosato. *Philbertia* has the outer lip thickened or varicose, lirate or dentate within when adult, the pillar usually smooth, the nucleus acute, smooth, and rather elevated; the species are small and the sculpture more or less clathrate or sculptured both axially and spirally.

The nearest group to it is *Glyphostoma*, which is large, with a more brilliant surface, a more fusiform profile, more contracted and emphatically armed aperture and different nucleus. *Philbertia* abounds in shallow temperate waters, while *Glyphostoma*, receding to the Eocene in time, apparently prefers tropical waters and even considerable depths.

Genus CALLIOTECTUM Dall, 1889.

A dissection of a better preserved specimen of *C. vernicosum*, the type of this genus, has revealed a minute radula with teeth of the Volutoid type, and the long esophageal caecum characteristic of the

Volutidae, to which family it must be referred as one of the degenerate abyssal forms which have lost their columellar plaits. A magnificent species related to *Calliotectum*, named *Prodallia dalli* and figured by Bartsch in 1915, was dredged in very deep water among the Philippines.

The other named groups among the Turritidae of the Pacific coast are not involved in synonymic difficulties and therefore need not be discussed here.

Preliminary list of names heretofore applied to divisions of the Turritidae with references and notes.

Acamptogenotia Rovereto, 1899, see *Pseudotoma* Bellardi not Stephens.

Aforia Dall, 1889, Bull. Mus. Comp. Zool., vol. 18, p. 99. Type, *Pl. circinata* Dall.

Agathotoma Cossmann, Rev. Crit. Pal., 3me Année, p. 1, 1889. New name for *Ditoma* Bellardi 1875, not Illiger, 1807. See Essais, vol. 3, p. 192, 1899.

? **Aliceia** Dautzenberg and Fischer, Mém. Soc. Zool. de France, vol. 10, p. 182, 1897. Type, *A. aenigmatica* Dautzenberg and Fischer, Mém. Soc. Zool. de France, vol. 10, p. 182, 1897, Azores. Nepionic shell, perhaps the young of a *Clavatula*.

Amblyacrum Cossmann, 1889, Cat. Ill., p. 295. Essais, vol. 2, p. 137. Type, *Pl. rugosa* Deshayes. This is a *Surcula* with short canal, moderate anal sulcus and Drillia-like sculpture. No varix behind outer lip.

Ancistrosyrinx Dall, 1881, Bull. Mus. Comp. Zool., vol. 9, p. 53. Type, *A. elegans* Dall. ?=*Cochlespira* Conrad, 1865, Amer. Journ. Conch., vol. 1, p. 20.

Anna Risso, 1826, Eur. Mér., p. 214, fig. 68. Type, *A. massena* Risso, Eur. Mér., p. 214=*Buccinum scacchianum* Philippi. Referred to Pleurotomidae by various authors but really a *Cantharus*.

Antiplanes Dall, Proc. U. S. Nat. Mus., vol. 24, No. 1264, p. 513, 1902. Type, *Surcula perversa* Gabb, 1865.

Aphanitoma Bellardi, Mon. Pl., 1875, p. 241. Type, *Turbinella labellum* (Bonelli), Bellardi and Michaud. Fischer, Man., p. 594, 1883, names as example *A. pecchiolii* Bellardi. Resembles a small *Genota* with two plications on the pillar. Zittel, Man. (French ed.), p. 286, 1887, accepts the type as *Pl. labellum*. Not *Aphanitoma* Cossmann. 1883.

Apiotoma Cossmann, 1889, Cat. Illustr., p. 263. Essais Pal., vol. 2, p. 73, 1896. Type, *Pl. pirulata* Deshayes. Eocene. Slender *Genota*-like shell.

Asthenotoma Harris and Burrows. Eocene and Olig. Paris, 1891, p. 113. New name for *Oligotoma* Bellardi, 1875, not of Westwood, 1836. Type, *Pl. basterotii* Desmoulins, 1842. Shell small, like small *Drillia* without varices, lirate outer lip, simple sinuate pillar. Sculpture of spiral cords. Miocene.

Atoma Bellardi, Mon. Pl., 1875, p. 324. Type, *A. hypothetica* Bellardi, Mon. Pl., 1875, p. 324 (1847). Not of Latreille 1796 (Arachn.)=*Enatoma* Rovereto, Syn. 1899, p. 3.

Awateria Suter, New Zealand Geol. Surv., Pal. Bull. No. 5, pt. 1, p. 57, 1917. Type, *A. streptophora* Suter; Pliocene, New Zealand.

Bathybela Kobelt, Icon. Eur., vol. 3, p. 276, 1905. Type, *Thesbia nudator* Locard.

Bathyclionella Kobelt, Icon. Eur., vol. 3, p. 279. Type, *Pl. quadruplex* Watson; abyssal. Apparently not related to *Clionella*.

Bathytoma Harris and Burrows, Eocene and Olig. Paris, 1891, p. 113, new name for *Dolichotoma* Bellardi, not Hope, 1839. Cf. *Megasurcula* Casey, and *Cryptoconus* v. Koenen.

Beisselia Holtzapfel, 1889. (Not seen.) Type, *Koenenia speciosa* Holtzapfel, Senonian; new name for *Koenenia* Holtzapfel, 1888, not of Beushausen; nor of Grassi, 1885. This is a pleurotomoid resembling a very large coarse *Fusinus.*

Bela Gray, 1847. Ann. Mag. Nat. Hist., vol. 20, p. 276. No type selected, includes *Pl. nebula*, Proc. Zool. Soc., 1847, p. 134, *nebula* selected by Gray as type. H. and A. Adams, 1853, cite *Ishnula* Clark MS. as a synonym of *Bela*, but Gray, Ann. Mag. Nat. Hist., vol. 20, p. 134, had already referred it to *Mangilia* Risso as synonym. *Bela* equals *Oenopota* Mörch, Yoldi Cat., pt. 1, p. 73, 1852, and *Lora*, Gistel, 1848.

Bellardia
Bellardiella } see *Philbertia.*

Bellaspira Conrad, 1867. Amer. Journ. Conch., vol. 3, p. 261. Type, *Mangelia virginiana* Conrad. Yorktown Miocene.

Belomitra Fischer, 1882. Man., p. 592. Journ. de Conchyl., vol. 30, p. 275. Type, *B. paradoxa* Fischer. Abyssal. Resembles *Bela* but has plicate pillar.

Borsonella Dall., 1908. Mus. Comp. Zool. Bull., vol. 43, p. 258. Type, *Borsonia dalli* Arnold.

Borsonia Bellardi, 1838. Bull. Soc. Géol. de France, p. 30, vol. 10.
2nd sect. Type, *B. prima* Bell. (2 plaits).
1st sect. Type, *B. bicoronata* Bell. (1 plait).
3rd sect. Type, *B. uniplicata* Nyst. (1 plait).

Brachytoma Swainson, Man., 1840, p. 314. Types, *Pl. stromboides* Sowerby, Man., fig. 381, and *B. castanea* Swainson, after Chemnitz. Both these species are *Drillia* Auct. and both are probably *Clavatulas. B. castanea* is, perhaps, identical with Gray's type (*umbilicata*) of *Drillia.*

Buchozia Bayan. (Not seen.) Type, *Auricula citharella* Lamarck. Eocene. +*Etallonia* Deshayes, 1862, not Oppel, 1861,+*Zafra* Cossmann, 1892, not of A. Adams, 1860. Very like *Bela* but somewhat heavier.

Calvatula Preston, Zool. Record, vol. 49, 1912, Moll., p. 61. Err. typogr. for *Clavatula.*

Candelabrum Dall, 1878, Bull. Mus. Comp. Zool., vol. 5, p. 61, not of Blainville, 1830. See *Ancistrosyrinx* Dall, 1881.

Catenotoma Cossmann and Pissaro, Bull. Soc. Géol. Normand., vol. 19, p. 39, 1900. Type, *Surcula catenata* Lamarck. Eocene.

Chauvetia Monterosato, Nom. Conch. Medit., 1884, p. 137, new name for *Nesaea* Risso, 1826, not Lamarck, 1812–16. Type is stated to be *Buccinum candidissimum* Philippi. This species appears to be a cancellate *Anachis.* Cossmann refers it to *Donovania* but the type is not of that genus. In 1890 Monterosato refers it to the group of *Raphitoma vulpecula.*

Cirillia Monterosato, 1884. Nom. Conch. Medit., p. 133. Type, *Pl. linearis* Montagu;+*Leufroyia* Monterosato, p. 134 (type, *Pl. leufroyi* Michaud). ?=*Anna* Risso, Eur. Mér., p. 126 (*A. massena* Risso). *Anna* equals *Cantharus* sp. Nucleus short, the last whorl unicarinate; the surface roughly sculptured, outer lip thickened, not lirate, pillar simple.

Citharopsis Pease, Amer. Journ. Conch., vol. 4, p. 97, 1868, 1st sp. *Cithara ornata* Pease, Amer. Journ. Conch., vol. 4, p. 97, 1868. Small Indopacific *Anachis;* not *Cytharopsis* A. Adams, 1865.

Clathrodrillia Dall, 1918. Type, *Pl. gibbosa* Reeve.

Clathromangilia Monterosato, Nom. Conch. Medit., p. 131, 1884. Monotype *Pl. granum* Philippi, 1844. Coarsely clathrate, small; varicose outer lip.

Clathurella Carpenter, Maz. Cat., 1857, p. 399. New name for *Defrancia* Millet, 1827, not Bronn (1825). Type, *Defrancia pagoda* Millet, selected by Dall, Mus. Comp. Zool. Bull., vol. 43, p. 259, 1908, no type having previously been designated. For species commonly referred to *Clathurella*, see under *Philbertia* Monterosato. Not *Clathurella* Cossmann, 1896 (*C. rava* Hinds) nor of Bucquoy, Dautzenberg and Dollfus, 1882. Type, *C. purpurea* Montagu (=*philberti*+*purpurea*+*corbis* Monterosato, 1884.)

Clathurina Melvill, Apr., 1917, Trans. Mal. Soc., p. 185. Type, *Pl. foraminata* Reeve. See *Philbertia.*

Clavatula Lamarck, Syst., 1801, p. 84. Type, *C. coronata* Lamarck, Syst., 1801, p. 84, not of Swainson, Man., 1840, p. 314 (*sulcata* Swainson, Man., 1840, p. 314). < *Pleurotoma* Lamarck, 1822. +*Clavicantha* Swainson, 1840, Man., p. 314. ?+*Drillia* Gray, 1838, Ann., vol. 1, p. 28. Type, *D. umbilicata* Gray. Not *Drillia* Auct. +*Brachytoma* Swainson, 1840, Man., p. 314; (*castanea* Swainson).

Clavatula Swainson, 1840, Man., p. 314. Type, *C. sulcata* Swainson, Man., p. 314, 1840,=*Murex gibbosus* Born, Index, 1778; Test. Mus. Vind., 1780, p. 321; +*Pl. flavidula* Lamarck var., Kiener, Icon., p. 31, 1839;=*Drillia* Auct., not *Clavatula* Lamarck, 1801.

Clavicantha Swainson, 1840, Man., p. 314;=*Clavatula* Lamarck, 1801, not Swainson, 1840.

Clavosurcula Schepman, *Siboga* Exp., livr. 64, Mon. 49′ e, p. 429, 1913. Type, *C. sibogae* Schepman. Resembles *Steiraxis.*

Clavus Montfort, Conch., p. 434, 1810. Type, *C. flammulatus* Montfort, Conch., vol. 2, p. 434, 1810, not *Clava* Martyn et al. <*Drillia* Auct. A smooth species with depressed anal fasciole and tubercles on the shoulder, spire slender, last whorl short, with subsutural callus, sharp outer lip and plain columella.

Clinura Bellardi, Mon. Pl., 1875, p. 204. Type, 1st sect. *Pl. calliope* Brocchi, 1814. (short spire.) 2nd sect. *Pl. elegantissima* Forbes. (long spire.)

Clionella Gray, Proc. Zool. Soc., 1847, p. 153. Type, *Buccinum sinuatum* Born, 1778;=*Melatoma* Swainson, 1840, not Anthony, 1847.

Cochlespira Conrad, 1865, Amer. Journ. Conch., vol. 1, p. 20. Type, *Pl. cristata* Conrad. Oligocene.

Cochlespirella Casey, Proc. Acad. Nat. Sci. Phila., 1903, p. 279. Type, *Fusus nanus* Lea, Eocene, and includes *Pl. insignifica* Heilprin. Cossmann, Essais, p. 221, 1906, on the basis of *insignifica* refers this to *Peratotoma.*

Cochlespiropsis Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 143, 1st sp. *Pl. engonata* Conrad, Eocene. Cossmann, Essais, p. 221, 1906, unites this with *Rouaultia.*

Columbarium v. Martens, Conch. Mitt., vol. 2, p. 105, 1881. Type, *Pleurotoma* (*Col.*) *spinicincta* v. Martens, Conch., Mitt., vol. 2, p. 105, 1881.

Comarmondia see *Philbertia.*

Conopleura Hinds, Voy. Sulph., Moll., 1844, p. 24. Type, *C. striata* Hinds, Voy. Sulph., Moll., p. 24.

Cordieria Rouault, 1848, Bull. Soc. Géol. de France, sér. 2, vol. 5, p. 207. Type not indicated. Tryon, Struct. Conch., 1883, cites *Pl. pyrenaica* Rouault. Cossmann, Essais, vol. 2, p. 98, 1906, names *C. iberica* Rouault. Not *Cordieria* Monterosato, 1884. Two plaits on the pillar as restricted.

Cordieria Monterosato, Nom. Conch. Medit., 1884, p. 131. 1st sp. *Pl. reticulata* (Renieri) Brocchi; 2nd Pl. *cordieri* Payraudeau, the latter cited as type in Moll. Roussillon, vol. 2, p. 767, 1908. Not *Cordieria* Rouault, 1848. Close to *Philbertia* Monterosato.

Coronia Gregorio, Mon. Claib., 1890, p. 23. 1st sp. *Pl. acutirostra* Conrad;=*Gemmula* Weinkauff, 1875, not *Coronia* Ehrenberg, 1840.

Crassispira Swainson, Man., 1840, p. 313. Type, *Pleurotoma bottae* Valenciennes in Kiener, 1839+*fasciata* Swainson, Man., 1840, p. 313.

Crassopleura Monterosato, Nom. Conch. Medit., 1884, p. 127; monotype *Pl. maravignae* Bivona, 1838,+*P. incisa* Reeve, 1843.

Crossopleura Monterosato, Journ. de Conchyl., 1879, p. 117, 1890. Monotype, *Pl. maravignae* Bivona.

Cryptoconus v. KOENEN, 1867. Type, *Pl. filosa* Lamarck. Ueber *Conorbis* und *Crytoconus* v. Koenen, 1867, p. 11, fig. 8 (not seen); cf. Arch. Naturg., vol. 2, p. 211, 1880. +*Megasurcula* Casey, 1904.

Cryptogemma DALL, 1918. Type, *Gemmula benthina* Dall.

Cymatosyrinx DALL, 1889, Bull. Mus. Comp. Zool., vol. 18, p. 95. Type, *Pl. lunata* Lea.

Cythara SCHUMACHER, Essais, p. 245, 1817. Type, *C. striata* Schumacher=*Cancellaria citharella* Lamarck 1822. This includes the species with short spire, denticulate outer lip and striated pillar, the aperture narrow. Cossmann states this name was used before Schumacher binomially (Essais, p. 121), but this appears to be erroneous.

Cytharella MONTEROSATO, Bull. Mal. Ital., 1875, p. 6. Type, *Pleurotoma bertrandi* Payraudeau. Cf. *Ditoma* Bellardi, 1875. =*Mangilia* Cossmann, not Risso. These are the small species with thickened but not lirate or denticulate outer lip and pillar; the spire usually shorter than the aperture, the surface longitudinally ribbed, smooth, or spirally minutely sculptured; nucleus small, smooth. Not *Cytherella* Rupert Jones, 1849, Crustacea, from *Cythere.*

Cytharopsis A. ADAMS, 1865, Ann. Mag. Nat. Hist., vol. 15, p. 323. Type, *Mangilia cancellata* A. Adams. Not *Citharopsis* Pease, Oct., 1868.

Daphnella HINDS, Voy. Sulph., Moll., 1844, p. 25. Type, *D. limnaeiformis* Kiener.

Daphnellopsis SCHEPMAN, *Siboga* Exp. livr. 64, Mon. 49′ e., p. 449, 1913. Type, *D. lamellosa* Schepman, *Siboga* Exp. livr. 64, p. 449, 1913. Like *Daphnella* but with heavily callous lips.

Daphnobela COSSMANN, 1896, Essais, p. 93. Type, *Buccinum junceum* Sowerby. Eocene. Shell extremely like *Aesopus.*

Defrancia MILLET, see *Clathurella* Carpenter.

Diaugasma MELVILL, Proc. Mal. Soc. London, 1917, p. 141. Type, *Daphnella epicharta* Melvill and Standen.

Diploconus SANDBERGER. (Not seen.) Not *Diploconus* Haeckel (Protista), 1860; nor of Candèze (Coleoptera) 1860, nor of Zittel, Cephalopoda, 1868 (not seen).

Ditoma BELLARDI, 1875, Mon. Pleur., p. 295. Not *Ditoma* Illiger, 1807, Coleoptera. Type, *Mangilia angusta* Jan. ?+*Cytharella* Monterosato, *q. v.*=*Agathotoma* Cossmann, Rev. Crit. Pal., 1889, vol. 3, p. 45. Also Essais, vol. 3, p. 192.

Dolichotoma BELLARDI, Mon. terz. Piem., p. 229, 1875. Monotype, *Pl. cataphracta* Brocchi. Not *Dolichotoma* Hope, 1839. =*Bathytoma* Harris and Burrows, 1891, new name (not needed). =*Cryptoconus* v. Koenen (1840, *fide* Zittel). 1867 *fide* Fischer. +Megasurcula Casey, 1904;=*Doligotoma* Weinkauff, 1876, Jahrb. Mal. Ges., p. 8.

Doligotoma WEINKAUFF, 1876, Jahrb. Mal. Ges., p. 8,=*Dolichotoma* Bellardi not Hope.

Donovania BUCQUOY, DAUTZENBERG, and DOLLFUS, 1882, Moll. Roussillon, vol. 1, p. 112. Type, *D. minima* Montagu=*brunneum* Donovan, 1804. *Buccinum minimum* Montagu, 1803, is preoccupied by *B. minimum* Turton, 1802, *fide* Iredale, 1915. +*Lachesis* Risso, 1826, not Daudin, 1804;+*Nesaea* Risso, 1826, not Lamarck, 1816.

Drillia GRAY, see *Clavatula* Lamarck and *Clavus* Montfort. Also *Crassispira* Swainson, and *Clavatula* Swainson not Lamarck. *Drillia* Gray, Ann. Nat. Hist., vol. 1, 1838, p. 28. Type, *D. umbilicata* Gray. *Brachytoma* Swainson, 1840 (*eastanea*), is synonymous. *Brachitoma* (*strombiformis* Sowerby) is also a *Drillia.*

Drilliola (MONTEROSATO, MS.) COSSMANN, 1903, Essais, vol. 5, p. 188. Type, *D. emendata* Monterosato, Medit. Cossmann states that it goes between (his)

Eucithara and *Clathurella* and has a flattened later spirally sculptured protoconch.

Elaeocyma Dall, 1918. Type. *Drillia empyrosia* Dall.

Enatoma Rovereto, 1899, see *Atoma.*

Endiatoma Cossmann, 1896, Essais, p. 106. Type, *Oligotoma quadricincta* Cossmann;=*Aphanitoma* Cossmann, 1883, not Bellardi, 1875. Eocene.

Eoclathurella Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 166, 1st sp. *E. jacksonica* Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 166. Eocene. He also refers to this group *Mangilia meridionalis* O. Meyer. Upper Claibornian. Cossmann, 1906, Essais, p. 223, suspends judgment on account of unfigured type.

Eodrillia Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 159, "Among the typical species" are *depygis* Conrad, *lonsdalii* Lea, *surculopsis* Gregorio, and *texana* Conrad (Casey). Cossmann, 1906, Essais, p. 223, unites this with *Eopleurotoma.*

Eopleurotoma Cossmann, 1889, Cat. Illustr., p. 269. Type, *Pl. multicostata* Deshayes. Eocene. Casey refers *Pl. nupera* Conrad, *gemmata* Conrad, *hoeninghausi* Lea, and *properugosa* Gregorio to this group (1904). Cossmann, 1906, Essais, p. 223, refers *Eodrillia* Casey, to this section.

Eosurcula Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 145, 1st sp. *Pl. moorei* Gabb. Eocene. Cossmann, Essais, p. 222, 1906, admits this as section of *Surcula* s. s. on the ground of a narrower protoconch.

Epalxis Cossmann, 1889, Cat. Ill., p. 254. 1896, Essais, vol. 2, p. 103, type named *Pleur. crenulata* Lamarck. Eocene. Small, obscure plait on pillar, shell in general recalling some of the Mangilias.

Etallonia Deshayes, 1862. Paris basin, vol. 2, p. 605. Type, *E. prisca* Deshayes. Eocene. Of the two species one is an *Acteon* or related Opisthobranch, the second a pleurotomoid recalling *Gymnobela.* =*Buchozia* Bayan, 1873, new name. Not *Etallonia* Oppel, 1861.

Eubela Dall, 1889, Bull. Mus. Comp. Zool., vol. 18, pp. 102–6. Type, *Daphnella limacina* Dall.

Eucheilodon Gabb, Journ. Acad. Nat. Sci. Phila., vol. 4, 1860, p. 379. Type, *E. reticulata* Gabb, Journ. Acad. Nat. Sci. Phila., vol. 4, pl. 667, fig. 18. Shell much like *Glyphostoma* but attenuated in front, outer lip not expanded, the aperture narrow and columella denticulate in the adult. Cossmann spells this *Euchilodon,* ascribes the genus to Heilprin, cites *E. crenocarinatus* Heilprin, 1880, as type! Essais, vol. 3, p. 189, Apr., 1889.

Eucithara Fischer, 1883, Man., p. 593. New name for *Cythara* Schumacher, 1817, not Klein! Klein being nonbinomial this name is useless. The type mentioned by Fischer is *Mangilia stromboides* Reeve.

Eucyclotoma Boettger, 1895, Nachrbl. d. Mal. Ges., p. 55. Type, *Clathurella bicarinata* Reeve, *fide* Cossmann. (Should be Pease, not Reeve.) Indopacific. Shell with two very prominent carinae, beaded, with Clathurelloid aperture. Cossmann names *bicarinata* as type. Boettger gives (1) *tricarinata* Reeve, and (2) *bicarinata* Pease, but does not designate either as type.

Exilia Conrad, Journ. Acad. Nat. Sci. Phila., ser. 2, vol. 4, p. 291, pl. 47, fig. 34, 1860. Type, *E. pergracilis* Conrad. Referred by Conrad to Pleurotomidae but really Chrysodomoid.

Folineaea Monterosato, Nom. Conch. Medit., 1884, p. 136. Type, *Buccinum lefebvrii* Maravigna, 1840,+*B. folineaea* Philippi, Moll. Sic., vol. 2, pl. 27, fig. 10. Hardly differs from *Clathromangilia* and is placed as a synonym of *Donovania* by Cossmann. In 1890 Monterosato spells it *Folinia.* Not *Folinia* Crosse, 1868.

Fusitoma Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 163. Type, *F. sipho* Casey (ex Aldrich), Trans. St. Louis Acad., vol. 14, 1904, p. 163. Cossmann, 1906, Essais, p. 223, suspends judgment for want of data.

Gemmula Weinkauff, 1875, Jahrb. d. Deutsche Mal. Ges., vol. 2, p. 287. Type, *Pl. gemmata* Hinds. No type selected in 1875. Cossmann, 1896, selects *gem-*

mata. +*Hemipleurotoma* Cossmann, *fide* Casey, 1904. Cossmann, 1906, holds to the division. Not *Gemmula* Deshayes (in Dall) 1902.

Genota H. and A. Adams, Gen. vol. 1, p. 89, 1853. +*Genotia* Tryon, Fischer, etc. em. Type, *Pl. mitriformis* Wood, first of two species.

Ginnania Monterosato, Nom. Conch. Medit., 1884, p. 127, 1st sp. *Pl. fuscata* Philippi; 2nd *Pl. laevigatum* Philippi. The last is selected as type in Moll. Roussillon, vol. 2, p. 766, 1908. =*Mangilia* (*nebula* type) s. s.

Glyphostoma Gabb, Proc. Acad. Nat. Sci. Phila., 1872, p. 270; type, *G. dentifera* Gabb. *Mangiliinae.* ?+*Lienardia* Jousseaume, 1884, *Cl. rubida* Hinds. For relations see *Philbertia* and *Clathurella* Cossmann not Carpenter.

Glyptotoma Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 140, 1st sp. *Pl. crassiplicata* Gabb. Eocene. Two or three plaits on the pillar, median sinus with nodulous fasciole.

Gosavia Stoliczka, 1865. Volutoid placed with Pleurotomidae by Cossmann.

Gymnobela Verrill, 1884, Trans. Conn. Acad., vol. 6, p. 157. Type, *G. engonia* Verrill, fixed by Cossmann, 1896. No type selected by Verrill. Inoperculate, Bela-form, or swollen; nucleus cancellate; abyssal. Verrill's first species is *G. engonia*, his second and figured species is *curta.*

Haedropleura (Monterosato) Bucquoy, Dautzenberg, and Dollfus, Moll. Roussillon, 1882, p. 110. Type, *Murex septangularis* Montagu, 1808. Resembles a *Cytharella* with elevated spire. Operculate.

Helenella Casey, Trans. St. Louis Acad., vol. 4, 1904, p. 167. Type (1st of two sp.) *Pl. multigranosa* E. A. Smith, St. Helena. Two plaits on the pillar. Recalls *Mitromorpha;* very small shells.

Hemilienardia Boettger, Nachrbl. d. Deutsche Mal. Ges., 1895, p. 52. Type, *Clathurella malleti* Recluz. Very short, stumpy, inflated, strongly cross-sculptured, bright-colored, small shells.

Hemipleurotoma Cossmann, 1889, Cat. Ill., p. 264. Type, *Pl. archimedis* Bellardi. In Essais Pal., 1896, p. 78, Cossmann proposes another type, *Pl. denticula* Basterot. He regards *Coronia* Gregorio as synonymous.

Hemisurcula Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 150. Type, *Pl. silicata* Aldrich. Gregg's Landing Eocene. Cossmann, 1906, Essais, p. 222, rejects this on the ground of insufficient characters.

Heterotoma Auct. after *Heterotomatae* of Bellardi, Moll. Piem. Mon. Pleur., 1847, p. 7. Not *Heterotoma* Latreille, 1829. Bellardi did not propose a genus *Heterotoma* but named a group in the plural number. In any case, the name was more than once preoccupied.

Homotoma Bellardi, 1875, Mon. Pl., p. 296. No type selected. Fischer, Man., p. 593, 1883, selects *H. textilis* Brocchi. Bellardi's species are heterogeneous. *Textilis* resembles very much a small *Fusinus.* Equals *Peratotoma* Harris and Burrows, 1891. Not *Homotoma* Guerin-Méneville, 1829. In his preliminary synopsis, 1875, Bellardi divides *Homotoma* into Sect. I, Type, *H. reticulata* Renieri, and Sect. II, Type, *H. semicostata* Bellardi.

Irenosyrinx Dall, 1908, Mus. Comp. Zool. Bull., vol. 43, p. 257. Type, *Pleurotomella goodei* Dall.

Ishnula (Clark MS.), Gray, Proc. Zool. Soc., 1847, p. 134. Not *Ischnula* Mörch, Mem. Soc. Mal. Belg., vol. 4, 1869, p. 21, type *Pl. impressa* Mörch (=*Bela*).

? Kenyonia Brazier, Proc. Linn. Soc. N. S. Wales, vol. 21, p. 346, 1896 (not seen). Type, *K. pulcherrima* Brazier, Proc. Linn. Soc., N. S. Wales, vol. 21, 1896, p. 347. New Hebrides.

Koenenia Holtzapfel 1888, Paleontographica, vol. 34, Moll. der Sachsener Kreide, 1st abth., p. 91. Type, *K. speciosa* Holtzapfel. Cretaceous. Not *Koenenia* Grassi, 1885. Equals *Beisselia* Holtzapfel, 1889.

Kylix Dall, 1918. Type, *K. alcyone* Dall.

Leptosurcula Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 157. Type, *Pl. beadata* Harris. Eocene. Cossmann, 1906, Essais, p. 223, judgment suspended.

Leucosyrinx Dall, 1889, Mus. Comp. Zool. Bull., vol. 18, p. 75. Type, *Pl. verrilli* Dall.

Leufroyia Monterosato, 1884. Nom. Conch. Medit., p. 134. Type, *Pl. leufroyi* Michaud.

Lienardia Jousseaume, Bull. Soc. Zool. de France, vol. 8, p. xl, 1884. Type, *Clathurella rubida* Hinds, Indopacific. Also, Bull. Soc. Zool. de France, vol. 9, p. 184, 1884. Cf. *Glyphostoma* Gabb.

Lophiotoma Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 130. 1st sp. *Pl. tigrina* Lamarck. Recent. Cossmann, Essais, 1906, p. 220, refers this to *Pleurotoma* s. s.

Lora Gistel, Naturg., 1848, p. ix, sole example *Tritonium viridulum* Fabricius, which is a *Bela*, probably *B. exarata* Möller, according to the type-specimen.

Lyromangilia Monterosato, 1917, Bull. Soc. Zool. Ital., ser. 3, vol. 4, (separate copies, p. 25). Type, *Pl. taeniata* Deshayes, Mediterranean.

Lyrosurcula Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 156. 1st sp. *L. elegans* Casey, Claibornian. Cossmann, 1906, Essais, p. 222, expresses no opinion as type is not figured.

Mangelia Risso, Eur. Mér., 1826, vol. 4, p. 219; no type mentioned. 1st sp. *M. costulata* Risso, equals *nebula* Montagu, taken as type by Bellardi, 1847; Kobelt, 1905; Dall, 1908; etc. +*Raphitoma* Weinkauff, Conch. Cab., 1876, types *nebula* Montagu and *harpula* Brocchi, not *Raphitoma* Bellardi, 1847, but Bellardi, in 1875, p. 323, states that *M. vulpecula* Brocchi is typical *Mangilia*. Shell elevated, spire longer than the aperture, longitudinally ribbed, spirally minutely sculptured; pillar smooth, outer lip thin, simple, notch at the suture, nucleus smooth, short, last turn finely cancellate, no operculum. Cossmann substitutes a new type (Essais, p. 114, 1896) *Pl. vauquelini* Payraudeau for *Mangilia* and unites with it *Clathromangilia* Monterosato, 1884; *Cytharella* Monterosato, 1875; *Pseudoraphitoma* Boettger, 1895; and *Paraclathurella* Boettger, 1895. Thus Cossmann's group = *Cytharella*. *Bela* (Leach) Gray, 1847, is a synonym of *Mangelia* with the same type.

Mangiliella Bucquoy, Dautzenberg, and Dollfus, Moll. Roussillon, p. 108, 1882. Type, *Mangilia multilineolata* Deshayes. Like *Haedropleura* but more slender and not operculate.

Megasurcula Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 147 Founded on the recent *Surcula carpenteriana* and *tryoni* of Gabb. No type designated. Recent, California. +*Megalosurcula* Cossmann, 1906, Essais, p. 222. =*Cryptoconus* v. Koenen, 1867. Cossmann, Essais, p. 222, refers it to *Bathytoma*.

Melatoma Swainson, Mal., 1840, p. 342. Type, *M. costata* Swainson, Mal., 1840, p. 342, fig. 104. +*Clionella* Gray, Proc. Zool. Soc., 1847, p. 153. Not *Melatoma* Anthony, 1847.

Mesochilotoma Seeley, Ann. Mag. Nat. Hist., ser. 3, vol. 7, p. 284, 1861. Monotype *M. striata* Seeley, Ann. Mag. Nat. Hist., ser. 3, vol. 7, p. 284, 1861. Cretaceous. Equals *Surculites* Conrad, 1865, q. v.

Microdrillia Casey, Proc. Acad. Nat. Sci. Phila., 1903, p. 276. 1st sp. *Pl. cossmanni* O. Meyer (=*meyeri* Cossmann) Eocene. Cossmann, 1906, Essais, pp. 223–4, admits this as a section of *Asthenotoma*.

Microsurcula Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 154. Type, *M. nucleola* Casey. Includes *Pl. georgei* Harris. (Woods Bluff.) Cossmann, Essais, p. 222, 1906, expresses no opinion as the type is unfigured.

Mitromorpha A. Adams, Ann. Mag. Nat. Hist., ser. 3, 1865, vol. 15, pp. 182 and 322. Type, *M. filosa* Carpenter, Ann. Mag. Nat. Hist., ser. 3, vol. 15, 1865, p. 182. Position doubtful, usually classed near the *Mitras*. See Iredale, Proc. Mal. Soc., vol. 12, p. 328, 1917.

Moniliopsis Conrad, 1865, Amer. Journ. Conch., vol. 1, p. 143. Type, *Pl. elaborata* Conrad, 1832, Fos. Sh. Tert. form. 1, p. 52, pl. 17, fig. 19. Recalls *Surcula inermis* Carpenter but has a sutural band and much more emphatic and elegant sculpture. Conrad's figure is very inadequate.

Nannodiella Dall, 1918. Type, *N. nana* Dall.

Nicolia Gregorio (not seen). Not *Nicolia* Malmgren, Verm. 1865.

Oenopota Mörch, Yoldi Cat., vol. 1, p. 78, 1852. 1st sp. *Pl. pleurotomaria* Couthouy. +*Onopota* H. and A. Adams, 1858, Gen., p. 654. + *Bela* auct. not (Leach MS.) Gray, 1847. =*Lora* Gistel, 1848.

Oligotoma Bellardi, 1875, p. 235. Type, *O. meneghinii* Mayer. ?=*Pl. basteroti* Desmoulins, 1842. Not *Oligotoma* Westwood, 1836. See *Asthenotoma* Harris and Burrows, Eoc. and Olig. Paris, 1897, p. 48, new name for *Oligotoma* Bellardi preoccupied.

Onopota. See *Oenopota* Mörch.

Orthosurcula Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 151. Types named are *Pl. longiforma* Aldrich (Red Bluff) and *Surcula transversaria* Lamarck. Cossmann, 1906, Essais, p. 222, refers this to *Surcula* s. s.

? **Otitoma** Jousseaume, 1898, Le Naturaliste, p. 106. Type, *O. otitoma* Jousseaume, Le Naturaliste, 1898, p. 106. Red Sea (not seen). ?=*Philbertia* Monterosato, 1884.

Otocheilus Conrad, Amer. Journ. Conch., vol. 1, 1865, p. 24. Type, *Fulgoraria mississippiensis* Conrad, 1848. Eocene. Cited by Tryon Man., p. 159. This is placed by Tryon in Pleurotomidae but is really a synonym or section of *Lyria* in the Volutidae where Conrad placed it.

Oxyacrum Cossmann, 1889, Cat. Illustr., p. 274; 1896, Essais Pal., p. 82. Type *Pl. obliterata* Deshayes. Eocene.

Paraclathurella Boettger, 1895, Nachrbl. d. Deutsche Mal. Ges., pp. 52, 56, Type, *Pl. gracilenta* Reeve,+*Pl. fusoides* Reeve. Philippines. Small slender Indopacific Clathurellas in the usually accepted sense.

Peratotoma Harris and Burrows, 1891, Eoc. and Olig. Paris. p. 113, new name for *Homotoma* Bellardi, 1875, not Guerin-Méněville, 1829–38.

Perrona Schumacher, Essai, p. 218, 1817. Type, *Murex perron* Chemnitz, Conch. Cab., vol. 10, figs. 1573–4, +*Perronia* Gray, Syn., 1842. +*Perronium* Blainville, Dict. Sci., 1825, vol. 38, p. 528. The type equals *P. tritonum* Schumacher, Essai, p. 218, 1817,+*Pleurotoma perronii* Reeve, 1843,+ *Murex perron* Gmelin, 1792.

Phandella Casey, Proc. Acad. Nat. Sci. Phila., 1903, p. 272. Monotype, *P. nepionica* Casey, Proc. Acad. Nat. Sci. Phila., 1903, p. 272. Upper Vicksburgian. Cossmann, 1906, Essais, p. 223, suspends judgment for want of data.

Philbertia Monterosato, Sin. Medit. 1884, p. 132. Type, *Pleurotoma bicolor* Risso.+*philberti* Michaud,+*purpurea* (Montagu) Bucquoy, Dautzenberg, and Dollfus, var. *bicolor*. *Heterotomatae* Bellardi, 1847, not *Heterotoma* Hartmann, 1844;+*Bellardia* Bucquoy, Dautzenberg, and Dollfus, 1882, not of Mayer, 1870; +*Bellardiella* Fischer, Man., Dec. 1883 (n. n. for *Bellardia*), not Tapp. Canefri, July, 1883, type, *Pl. gracilis;*+*Comarmondia* Monterosato, 1884, n. n. (p. 135) for *Bellardiella;*+*Clathurina* Melvill, Apr. 1917, type, *Pleurotoma foraminata* Reeve;+*Heterostoma* Cossmann, 1896, not of Bellardi, 1847. Group equivalent to *Clathurella* Auct. not Defrance. Mangiliinae. *Philbertia* has the outer lip thickened, lirate or dentate within when adult, pillar smooth, nucleus smooth, rather elevated and acute. Differs from *Glyphostoma* by smaller size, less brilliant surface, less fusiform profile, less contracted mouth and different nucleus.

Phlyctaenia Cossmann, Cat. Illustr., 1889, p. 245. Type indicated *Borsonia nodularis* Deshayes. Eocene of Paris. Not *Phlyctaenia* Hübner, 1816. Lepidoptera. +*Phlyctis* Harris and Burrows, 1881, new name. Equals *Cordieria* Rouault, 1849.

Phlyctis Harris and Burrows, 1881, Eoc. & Olig. Paris, p. 113. New name for *Phlyctaenia* Cossmann, 1889, not Hübner, 1816. Equals *Cordieria* Rouault, 1849.

Pholidotomia Cossmann, 1896, Essais, pt. 2, p. 111. Type, *Fusus subheptagonus* Orbigny. This belongs to the Volutidae, near *Volutoderma* et al., though placed in Pleurotomidae by Cossmann.

Phymorhynchus Dall, 1908, Mus. Comp. Zool. Bull., vol. 43, p. 258. Type, *Pleurotomella castanea* Dall.

Pleurobela Kobelt, 1904, Icon. Eur., vol. 3, p. 301. Sect. of *Belomitra* for *B. spelta* (Monterosato) Locard. =*Pleurobela* Monterosato MS.

Pleurofusia Gregorio, Mon. Claib., p. 33, 1890. Type, *Pl. longirostropis* Gregorio, Mon. Claib., p. 33, 1890, a variety of *Pl. servata* Conrad. Species resemble a coarsely spirally sculptured *Fusinus*. Cossmann makes it a synonym of *Surcula* (*javana* type).

Pleuroliria Gregorio, Mon. Claib., p. 38, 1890. Type, *Pl. supramirifica* Gregorio, Mon. Claib., p. 38, 1890,=*Pl. cochlearis* Conrad, var. A *Pleurotoma*, type of *albida* Perry, but smaller, the nucleus multispiral and acute (Casey).

Pleurotoma Lamarck, Prodrome, 1799, p. 73. Monotype, *Murex babylonius* Linnaeus, Amboyna. +*Pleurotome* Link, Rostock Samml., 1807, p. 118. Same type.

Pleurotomella Verrill, 1873, Amer. Journ. Sci., ser. 3, vol. 5, p. 15. Type, *P. packardi* Verrill.

Pleurotomina Beck, Amtl. Ber. Nat., Kiel, 1846 (1847), p. 115; new name for *Defrancia* Millet not Bronn. *Bela impressa* Mörch, sole species.

Pleurotomoides Bronn, Ital. Tert. Geb., 1831; Lethaea Geogn., vol. 2, 1838, pp. 1062, 1064; new name for *Defrancia* Millet not Bronn.

Pontiothauma E. A. Smith, Ann. Mag. Nat. Hist., vol. 16, p. 2, 1894. 1st species, *P. mirabile* Smith. Malabar coast, 1,250 fathoms. Report on anatomy see S. Pace, Journ. Linn. Soc., Zool., vol. 28, p. 455, 1903.

Protosurcula Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 144. Type, *Pl. gabbi* Conrad. Eocene, Texas. Cossmann, Essais, p. 221, 1906, unites this with *Surcula* (*javana*) s. s.

Pseudodaphnella Boettger, 1895, Nachrbl. d. Deutsche Mal. Ges., p. 58. Type, *Clathurella philippinensis* Reeve. Shell a good deal like an *Amphissa*.

Pseudomata v. Martens, Sitzb. d. Ges. für Naturf. Freunde zu Berlin, p. 19, 1901. Type, *Pl. chuni* v. Martens.

Pseudomelatoma Dall, 1918. Type, *Pl. penicillata* Carpenter.

Pseudoraphitoma Boettger, 1895, Nachrbl. d. Deutsche Mal. Ges., p. 56. Sole type, *Clathurella fairbanki* Nevill. A *Clathurella* with *Gemmula* sculpture and *Drillia*-like outer lip.

Pseudotoma Bellardi, Mon. Pl. 1875, p. 209. No type selected. 1st sp. *P. laevis* Bellardi, which is mentioned by Fischer, Man., 1883, p. 589. Dall, 1908, adopted *Pleurotoma intorta* Brocchi as type. In Bellardi's preliminary synopsis of Pleurotomidae, 1875, he mentions *Pl. intorta* as the type and it is the sole species given. Not *Pseudotomia* Stephens, 1852. Lepidoptera. Equals *Acamptogenotia* Rovereto, 1899, Syn., p. 3.

Pusionella Gray, Proc. Zool. Soc., 1847, p. 137. Type, *Murex pusio* Born, 1778. +*Netrum* Philippi, Abb., 1850, p. 118. *Fusus nifat* Adanson.

Raphitoma Bellardi (1847) Mon. Pleur., pp. 10, 84 (1875) no type fixed. Not *Raphitoma* Bellardi, 1878, Mon. Pleur., p. 323. where *vulpecula* Brocchi, which is a typical *Mangilia*, is cited by Bellardi as the type of the genus making it a synonym of *Mangilia*. *Raphitoma*, as first established, was very heterogeneous. In his preliminary synopsis Bellardi (1875) divides this group into two sections, I, type *R. vulpecula* Brocchi, and II, type *R. harpula* Brocchi. G. O. Sars, Norv., 1878, p. 218, tries to restrict *Raphitoma* (Bellardi) to spirally sculptured species. Type, *R. anceps* (Eichwald),=*Pl. boreale* Lovèn+*Defrancia teres* Forbes. The cancellate species he would leave in *Clathurella*. Cf. *Teres* Bucquoy, Dautzenberg, and Dollfus, also with *R. anceps* as type.

Rissomangilia MONTEROSATO, 1917, Bull. Soc. Zool. Ital., ser. 3, vol. 4, (separate copies, p. 24). Type, *Pl. bertrandi* Payraudeau. Mediterranean. =*Cytharella* Monterosato, 1875.

Rouaultia BELLARDI, 1877, Mon. Pl., pt. 2, p. 223. Type *Pl. subterebralis* Bellardi and Sismonda. 1 feeble plait on pillar, otherwise resembling *Gemmula*. This is *Cochlespira* Cossmann, 1896, not of Conrad. Cossmann, 1906, Essais, p. 221, unites *Cochlespiropsis* Casey (*engonata* Conrad) with *Rouaultia*.

Ruscula CASEY, Trans. St. Louis Acad., vol. 14, 1904, p. 161. 1st sp. *Pl. plicata* Lea, Claibornian. Cossmann, 1906, Essais, p. 223, suspends judgment in default of data.

Savatieria ROCHBRUNE and MABILLE, 1885, Bull. Soc. Phil. Paris, ser. 7, vol. 9, p. 101. Type, *S. frigida*, Rochbrune and Mabille; also Moll. Cap Horn., page II, 65, pl. 2, fig. 5, 1889. This, though referred to Pleurotimidae (sic), is obviously an *Anachis*. Not all the species referred to this genus by Strebel, Zool. Jahrb., 1905, are congeneric with the original type.

Scobinella CONRAD, Journ. Acad. Nat. Sci. Phila., ser. 2, vol. 1, p. 120, Aug., 1848. Type, *S. coelata* Conrad, pl. 12, figs. 8, 9. Vicksburg. +*Zelia* Gregorio, 1890, not Desvoidy, 1830. Shell with four or five plaits, more like a slender *Mitra* than a *Pleurotoma*.

Sinistrella O. MEYER, 1887, Senckenb. Ber., p. 18. Cossmann, Essais, pt. 2, p. 110. Type, "*Triforis*" *americanus* Aldrich. Eocene. Small, sinistral, spirally beaded. Cossmann (Essais, vol. 5, p. 120) regards it as a sinistral form of his *Trypanotoma*, 1893.

Sistenope COSSMANN, 1889, Cat. Illustr., p. 293. Essais, vol. 2, p. 133, 1896. Type, *Raphitoma polycolpa* Cossmann. Equals *Pleurotomella* Verrill, 1873, *fide* Cossmann, 1896.

Smithia, MONTEROSATO, Nom. Conch. Medit., 1884, p. 128. Monotype, *Pl. smithii* Forbes,=*striolata* Scacchi. +*Smithiella* Monterosato, 1890,=*Bela* s. s. Not *Smithia* Maltzan, 1883, nor of Edwards and Haime, 1851.

Smithiellia MONTEROSATO in Moll. Roussillon, vol. 2, p. 766, (1890?) 1908. New name for *Smithia* Monterosato, not Maltzan, 1883. Spelled *Smithiella* in Kobelt, Icon, Eur., vol. 3, p. 381, 1905.

Spergo DALL, Proc. U. S. Nat. Mus., vol. 17, p. 680, 1895. Type, *S. glandiniformis* Dall. Hawaii.

Spirotropis G. O. SARS, 1878, Moll. Reg. Arct. Norv., p. 242. Type, *S. carinata* Philippi.

Steiraxis DALL, 1895, Proc. U. S. Nat. Mus., 1895, p. 15. Type, *Pl.* (*St.*) *aulaca* Dall. Paucispiral operculum.

Strombina GREGORIO, 1890 (not of Bronn, 1849). Mon. Claib., p. 25. 1st sp. *Pl. stromboides* Lamarck. Equals *Gemmula* Weinkauff.

Suavodrillia DALL, 1918; type, *Drillia kennicottii* Dall. Alaska.

Subulata VON MARTENS, Sitzb. Ges. Naturf. Freunde zu Berlin, 1901, p. 17. *Pl. bisinuata* v. Martens. Off East Africa. Martens refers this to Anton, 1839, but Anton did not use the word in a nomenclatorial sense.

Surcula, see *Turricula*.

Surculina DALL, 1908, Mus. Comp. Zool., Bull., vol. 43, p. 260. Type, *S. blanda* Dall.

Surculites Conrad, Amer. Journ. Conch., vol. 1, p. 213, 1865. Type, *S. annosa* Conrad, Amer. Journ. Conch., vol. 1, 1865, pl. 20, fig. 9, Shark River, N. J. Eocene. Doubtful shell; aperture characters not known, sharp angle at shoulder, sutural band, sculpture feeble.

Surculoma Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 153. Type, *Pl. tabulata* Conrad (+*coelata* Lea). Claibornian. Cossmann, Essais, p. 222, 1906, makes this a section of *Amblyacrum* with wider sinus, bent canal and siphonal fasciole with umbilical chink.

Taranis Jeffreys, 1870, Ann. Mag. Nat. Hist., 4th ser., vol. 5, p. 447. Type, *T. mörchi* Malm.

Teleochilus Harris, Austr. Tert. Moll., 1897, p. 64. Type, *Daphnella gracillima* Tenison Woods, 1876. Tertiary of Australia. No sulcus. Shell somewhat like a thin *Dibaphus*.

Terebritoma Cossmann, 1892, Annuaire Géologique. Type, *Mangelia solitaria* Whitfield. Cretaceous of Syria. Small, short canal, spirally corded.

Teres Bucquoy, Dautzenberg, and Dollfus, Moll. Roussillon, vol. 1, p. 86, 1882. Type, *Pl. anceps* Eichwald. +*Teretia* Norman, new name, 1888. ?+*Tomopleura* Casey, 1904.

Thesbia Jeffreys, 1867, Brit. Conch., vol. 4, p. 359. Type, *T. nana* Jeffreys ex Lovèn. *Tritonium ? nanum* Lovèn, Ind. Moll. Scand., p. 12. *Mangelia nana* Forbes and Hanley, vol. 3, p. 461, pl. 112, fig. 8. Shell columbelloid, resembling *C. rosacea* Gould, radula pleurotomoid.

Thetidos Hedley, Funafuti Moll. Mem. Austr. Mus., vol. 3 ,pt. 7, p. 473, 1899. Type, *T. morsura* Hedley, Funafuti Island.

Tomella Swainson, Man., p. 314, 1840. Type, *Pl. lineata* Lamarck.

Tomopleura Casey, St. Louis Acad., 1904, p. 138. Type, *Pl. nivea* Philippi, 1851. =*Teres* Bucquoy, Dautzenberg, and Dollfus, 1882, p. 86, *Pl. anceps* Eichwald. +*Teretia* Norman, 1888, as emendation. *P. nivea* is unfigured, from the description it should resemble *albida* Perry, *virgo* Lamarck and similar species in sculpture but with a shorter canal, smaller size and more posterior notch. Cossmann, 1906, Essais, p. 220, refers this to *Drillia* s. s.

Trachelochetus Cossmann, Cat. Illustr., p. 254 (1890 *fide* Zool. Record). Essais Pal., vol. 2, 1896. Type, *Pl. desmia* Edwards. Eocene. Equals *Gemmula* Weinkauff, 1875.

Tripia Gregorio, Mon. Claib., p. 37, 1890. Type, *Pl. anteatripla* Gregorio, Mon. Claib., 1890, p. 38. Type, a small *Surcula*, feebly sculptured. In 1896, Cossmann refers it to *Crassispira* Swainson as synonym. Cossmann restores it to good standing, Essais, vol. 5, p. 188, 1903.

Tritonimangilia K. Martin, 1914, Leiden Samml. Geol. Reichmus., vol. 2, p. 126. Type, ————, Upper Oligocene, Java. (Not seen.)

Tropisurcula Casey, Trans. St. Louis Acad., vol. 14, 1904, p. 153. 1st sp. *Drillia caseyi* Aldrich. (Red Bluff.) +*Tropidosurcula* Cossmann, em. Essais, 1906, p. 222. Cossmann expresses no opinion for want of data.

Trypanotoma Cossmann (1893?) Essais, p. 109, 1896. Type, *Pl. terebriformis* O. Meyer, Eocene. Differs from *Oligotoma* (equals *Asthenotoma*) only by faint axial sculpture.

Turricula Schumacher, Essai, p. 217, 1817. Type, *T. flammea* Schumacher.+*tornatus* Dillwyn, 1817, not of Bolten, 1798. (Not *Clavatula flammea* Hinds, 1844.) +*Surcula* H. & A. Adams, Gen., 1853, vol. 1, p. 88. Type, *Murex javanus* Linnaeus. +*Surgula* Weinkauff, Conch. Cab., p. 7, 1875.

Turris Bolten, 1798, Mus. Bolt., p. 123. Type, *T. babylonius* Linnaeus. Not *Turris* Montfort, Conch., 1810. +*Pleurotoma* Lamarck, 1799, Prodr., p. 73. same type. +*Lophiotoma* Casey, 1904, p. 130, no type selected; 1st sp. *Pl. tigrina* Lamarck. +*Tomopleura* Casey, Trans. St. Louis Acad., 1904, p. 138, *P. nivea* Philippi.

Tylotia MELVILL, Proc. Mal. Soc., vol. 12, p. 160, 1917; type, *Pleurotoma auriculifera* Lamarck; new name for *Clavus* Auct., not of Montfort.

Typhlomangelia (M. Sars MS.) G. O. SARS. Moll. Norv., p. 241, 1878. Type, *Pl. nivalis* Lovèn. Pleurotominae.

Varicobela CASEY, Trans. St. Louis Acad., vol. 14, 1904, p. 162. Type, *Strombus smithi* Aldrich. (Red Bluff.) Cossmann, 1906, Essais, p. 223, suspends judgment for want of data.

Veprecula MELVILL, Proc. Mal. Soc., vol. 12, p. 141, 1917. No type mentioned; p. 188, type cited, *V. sykesii* Melvill and Standen.

Vielliersia MONTEROSATO, Nom. Conch., Medit., 1884, p. 128. Type, *Murex attenuata* Montagu, *Pl. viellicrsi* Michaud, 1829. (Typographical error for *Villiersia.*) Equals *Villiersiellia* Monterosato in Journ. de Conchyl., 1879, p. 117, 1890. Hardly differs from typical Mangilia. Not *Villiersia* Orbigny, 1837.

Villiersiella MONTEROSATO in Kobelt, Icon. Eur., vol. 3, p. 380, 1905. New name for *Vielliersia* Monterosato, 1884, not of Orbigny, 1837. (*Villiersia.*)

Zafra A. ADAMS, 1860, Ann. Mag. Nat. Hist., vol. 6, p. 331. Not *Zafra* Cossmann, 1892. Type, *Z. mitraeformis* A. Adams. Columbella-like small forms. Cf. also *Teleochilus* Harris. The *Zafrae* seem to be ribbed, the *Teleochili* smooth or nearly so, recalling *Bela laevigata*.

Zelia GREGORIO, Mon. Claib., p. 44, 1890. Type, *Borsonia* (*Zelia*) *sativa* Gregorio. Pillar triplicate, outer lip internally lirate, exterior elegantly sculptured. Not *Zelia* Desvoidy, 1830.

Zetekia DALL, 1918; type, *Z. denticulata* Dall. Panama.

The following changes of names have been found necessary:

Pleurotoma sello new name for *biseriata* E. A. Smith, 1882, not of Conrad, 1834.

Pleurotoma aesara new name for *asperulata* E. A. Smith, 1882, not of Lamarck, 1822.

Pleurotoma aglaia new name for *crassa* E. A. Smith, 1888, not of Edwards, 1856.

Pleurotoma agatho new name for *flexuosa* E. A. Smith, 1882, not of Munster, 1835.

Pleurotoma alcippe new name for *parilis* E. A. Smith, 1888, not of Edwards, 1860.

Pleurotoma amymone new name for *parva* E. A. Smith, 1888, not of Conrad, 1830.

Pleurotoma antiope new name for *recta* E. A. Smith, 1888, not of Anton, 1839.

Pleurotoma arethusa new name for *reticulosa* E. A. Smith, 1882, not of Edwards, 1860.

Pleurotoma roseotincta new name for *roseobasis* Pilsbry, 1902, not of E. A. Smith, 1888.

Pleurotoma berenice new name for *spinosa* E. A. Smith, 1882, not of Defrance, 1826.

Pleurotoma clymene new name for *tenella* E. A. Smith, 1882, not of Mayer, 1858.

Pleurotoma enna new name for *unifasciata* E. A. Smith, 1888, not of Deshayes, 1833.

Pleurotoma glauce new name for *ventricosa* E. A. Smith, 1888, not of Deshayes, 1833.

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NOTES ON THE SHELLS OF THE GENUS EPITONIUM AND ITS ALLIES OF THE PACIFIC COAST OF AMERICA

BY

WILLIAM HEALEY DALL
Honorary Curator of Mollusks, United States National Museum

No. 2217.—From the Proceedings of the United States National Museum,
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The genus called by Lamarck, in 1799, *Cyclostoma* (type, *Turbo scalaris* Linnæus) is more commonly known by the name of *Scalaria*, which he adopted in 1801. As this shifting of a name once given is inadmissible under the rules of nomenclature we are obliged to look further for the proper name of the genus.

In the anonymous Museum Calonnianum printed by the dealer, George Humphrey, after a manuscript of Hwass in 1797, the name *Scala* is used, and for some years the present writer adopted it for the genus. However, the inconveniences incident to the adoption of the nomenclature of this publication are so great that the International Committee on Zoological Nomenclature have decided to expunge it from the list of works to be cited in nomenclature, and the next name in order, *Epitonium* of Bolten in 1798, must be adopted.

The group is distributed all over the world and is usually rich in species, but sparse in individuals in any given fauna. E. de Boury has given much attention to it, and it is to be hoped his proposed monograph may not long be delayed since such excellent illustrations of the species as those he has published on minor groups are urgently needed to identify the many closely related forms. Many of the older descriptions are so brief as not to permit of the differentiation of similar species, and even the figures, especially of the smaller species, are more or less inadequate.

Among the principal features serving to identify the species are the presence or absence of spiral sculpture, of an umbilical perforation, and of a basal cord or disk. The number of the varices is, on the whole, very constant in most of the groups, following the rule that the greatest variation will be found where the normal number of varices is greatest. In a species with few varices the number is remarkably constant, except in the group typified by *E. lineatum* Say, where the number is irregular and the varices coarse and very few. The nucleus or nepionic shell is pretty uniform throughout the group, usually smooth, elevated or turbinate, and often of a darker color than the rest of the shell.

De Boury has divided the genus into a multitude of sections, which have a certain convenience in separating the species, but which in most cases tend to merge into the adjacent groups without any very marked distinction.

The Pacific coast of America is quite rich in species and doubtless there are many more tropical forms yet to be discovered. The South American coast has been very imperfectly explored and very few species have been reported therefrom. The older authors described very briefly and imperfectly quite a number of species which can only be identified by comparison with the original types, most of which are in the collection of the British Museum. Perhaps the best and most complete single collection is that brought together by De Boury and situated in the Paris Museum.

Owing to gross carelessness on the part of the compilers there are many erroneous localities given in several of their monographs. Species from the Philippines are ascribed to the Pacific coast of America, and quite incompatible localities are given to a single species. Some of these blunders will be corrected in the present paper.

The most common of our boreal species is *Epitonium* (*Boreoscala*) *greenlandicum* Perry, 1811, with which *subulatum* Couthouy, 1838 (not of Sowerby, 1825), and *planicosta* Kiener, 1838 (not *planicostata* Bivona, 1842), are synonymous. The subgenus *Boreoscala* was instituted by Kobelt in 1902; *Arctoscala* Dall, 1909, and *Liroscala* De Boury, 1909, are synonymous. Its distribution is circumboreal, though somewhat patchy, as it is often apparently absent where it would be expected. On the Pacific coast it is found from Point Barrow to Wrangell, Alaska, and the coast of Eastern Siberia; it is fossil in the Pleistocene terraces of Japan. It exhibits much more variability than the more southern species, both in slenderness and in the number of axial ribs, which vary from 8 to 17 in number, and also in the strength of these ribs. The strong spiral sculpture seems to be tolerably constant. *E. hemphilli* Dall, 1878, from the Pliocene of San Diego, is an analogous species.

The subgenus *Opalia* H. and A. Adams, 1853 (*Psychrosoma* Tapparone Canefri, 1876), is represented on the coast by several recent species and some fine Pliocene forms. The most common recent species is *O. wroblewskii* Mörch, 1876. This is *Scalaria borealis* Gould, 1852, not of Beck, 1839. A very solid white shell with seven or eight varices, more conspicuous on the early part of the spire, and a well-marked basal disk. It ranges from Forrester Island, Alaska, south to San Diego, California, where it is found in 53 fathoms, and also in the Pleistocene of the vicinity.

Opalia varicostata Stearns, 1875 (not of Sacco, 1890), of the San Diego Pliocene, is a large species with 10 or 11 ribs sometimes partly obsolete. *O. varicicostata* Cossmann, 1912, is synonymous. The *O. anomala* of Stearns, 1875, is practically without varices except near the tip of the spire, where traces may sometimes be found. It is an *Opalia* and not a *Crassiscala*, as supposed by De Boury. The Miocene *Catenoscala oregonensis* Dall, 1909, is accompanied by a large *Boreoscala condoni* Dall, and an *Opalia* of the *varicostata* type which I called *O. rugifera*. These large Epitoniums seem to be rather characteristic of the Northwest Coast Miocene.

A somewhat degenerate representative of the *Opalia* group is *B. pluricostata*, new species, ranging from Forrester Island, Alaska, to San Diego. It resembles the ribbed upper portion of *O. wroblewskii* a good deal, but is smaller and more cylindrical, with eight varices. It has seven whorls without the nucleus, the varices are continuous up the spire, the interspaces smooth, the basal disk octohedral from the intersection of the ribs, somewhat concave, and relatively smaller than in *wroblewskii*. Length, 16; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 56054. The type-specimen is from Neeah Bay, Washington.

Another group referred by Carpenter to *Opalia* is separated by De Boury under the name of *Dentiscala*. Representatives of this type are *D. crenatoides* Carpenter, 1864, from the Gulf of California, rather small with a coarse spiral rib on the basal disk and deep pits at the intersections of the nine axial ribs. A species which has generally been confused with this and is much more common, is *D. crenimarginata*, new species, which ranges from Monterey, California, to Puerto Libertad, Mexico. It is larger, much stouter, spirally striated, with a convex smooth basal disk, the 12 axial ribs on the last two whorls obsolete on the sides of the whorls but coronating the suture. It has 6 or 7 whorls without the nucleus, the varix at the aperture is heavy, and there is sometimes another heavy varix indicating a resting stage. Length, 16; diameter, 7 mm. U. S. Nat. Mus. Cat. No. 111207. The type-specimen comes from La Paz. A species somewhat intermediate between the two above noted, *D. insculpta* Carpenter, 1864, is found in the Pleistocene of Santa Barbara, California, but it is without the fine spiral surface sculpture.

A smaller species, *D. nesiotica* Dall, was dredged by me in 16 fathoms at Catalina Island. It has 12 varices, rather feebly carried over the whorl and obsolete on the basal disk. Sharp spiral sculpture covers the surface and the terminal varix is heavy; there are six whorls, not including a smooth nucleus of a whorl and a half; the suture is markedly coronated by the ribs. Length, 10.5; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 56900.

Another group referred to *Opalia* by Carpenter has been separated by De Boury in 1889 under the name of *Nodiscala*. These are small, slender imperforate shells with ill-defined axial nodes or ribs, but only one true varix, which is terminal and much thickened. The shells when in good condition have a soft calcareous outer coat which is punctate or minutely sculptured, recalling the outer coat in *Chlamys*. Four species of this group have been described from the coast, *E. mazatlanicum* Dall, 1908; *E. retiporosum* Carpenter, 1864, ranging from Catalina Island to the Gulf of California; *E. spongiosum* Carpenter, 1864, from Monterey, California; and *E. mexicanum* Dall, 1908, from Acapulco.

A very distinct group of boreal forms is *Acirsa* Mörch, 1857 (*Arcisa* Nyst, 1873), founded on *Scalaria borealis* Beck, 1839 (not of Gould, 1852), of which *S. eschrichtii* (Hölboll) Möller, 1842, and *S. ochotensis* Middendorff, 1849, are synonyms. This species is circumboreal, the more southern specimens are more delicate and smaller than those from truly arctic waters, which at most form a variety which will take Middendorff's name. On the Pacific side this species ranges from Bering Straits through Bering and the Okhotsk Seas to the Aleutian Islands.

Curiously enough a minute form has been received from Cape San Lucas which appears to belong to this group, and if so was probably washed up from deep water. The shell is littoriniform, acute, with seven whorls, including the somewhat styliform smooth nucleus; the sutures are appressed, the whorls only moderately convex, with very faint axial indications of ribbing, and sharp uniform spiral striation. A prominent thread upon which the suture is laid marks the periphery. The terminal varix is inconspicuous, the margin of the aperture being thickened inside with little outside expansion. Length, 3.6; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 74020. This may take the name of *A. exopleura*.

A slender white spirally sulcate shell from the Gulf of California, described by Carpenter as *Acirsa menesthoides* in 1864, may perhaps be referred to the genus *Couthouyella* Bartsch, 1909, but its proper place awaits for determination specimens containing the operculum and soft parts.

Ferminoscala Dall, 1908, contains large yellow or brown species with finely reticulated surface, large basal disk, and a thick heavy terminal varix. Before the varix is formed the shell has much the aspect of *Amaea magnifica* Sowerby. *E. ferminianum* Dall, 1908, ranges from Point Fermin in the Gulf of California to Panama. *E. brunneopictum* Dall, 1908, was dredged off Cerros Island, Lower California. *E. pompholyx* Dall, 1889, ranges from Cape San Lucas to the Galapagos Islands, in deep water.

The next group in order is *Asperiscala* De Boury, 1909, of which the type is the elegant *Scalaria bellastriata* of Carpenter, 1864, which has 15–16 varices and clean-cut spiral sculpture. Its ranges from Monterey to San Pedro, California. The only other described species of this group from the coast is *E. lowei* Dall, 1906, a species with 26 varices from Catalina Island. There are quite a number of hitherto undifferentiated forms of this group in the United States National Museum collection, as follows:

EPITONIUM ACAPULCANUM, new species.

Shell small, white, acute, imperforate, with a slender three-whorled smooth nucleus and five subsequent whorls; varices 11, continuous over the suture up the spire which they nearly encircle; spiral sculpture of closely adjacent flattish threads covering the whorl; anterior face of the varices smooth, without any spinosity at the shoulder. Length, 5; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 59337. Range, La Paz to Acapulco.

EPITONIUM COOKEANUM, new species.

Shell small, pink, solid, acute, imperforate, the nucleus lost, with eight well-rounded subsequent whorls; with 10 rather solid, smooth continuous white varices making less than half a turn round the spire; spiral sculpture of extremely fine uniform threads covering the whorl between the varices; the terminal varix thicker than the others; all the varices broader at the intersection with the suture but not spinose. Length, 9.5; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 211019. Range, San Diego to the Gulf of California.

This is named in honor of Miss J. M. Cooke, of San Diego, a most assiduous collector, to whom, and to the work of her late brother, the Museum is indebted for much interesting material.

EPITONIUM XANTUSI, new species.

Shell small, acute, white, thin, with seven well-rounded whorls exclusive of the (lost) nucleus; varices low, thin, sharp, 12 in number, continuous over the spire which they half encircle, but not expanded over the rather deep suture; spiral sculpture of flattish adjacent threads over the whole surface of the whorl between the varices; terminal varix hardly thicker, none of them spinose. Length, 5.5; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 4107. Range, Cape San Lucas (Xantus) and La Paz, Lower California.

EPITONIUM ARNOLDI, new species.

Shell of moderate size, white, thin, with eight well-rounded whorls exclusive of the (lost) nucleus; varices on the last whorl 13, on the first four whorls they are feeble, on the next two distinct and crowded, on the last two more distantly spaced, low, and cord-like; spiral sculpture of extremely fine close-set striae; terminal varix not enlarged, the varices not continuous over the suture nor enlarged or spinose; aperture obliquely ovoid. Length, 14; diameter, 5.5 mm. U. S. Nat. Mus. Cat. No. 106875. Range, beach at San Pedro, California, Delos Arnold.

EPITONIUM PACIS, new species.

Shell white, thin, with eight well-rounded whorls exclusive of three smooth, acute, nuclear turns; varices 18, with wider interspaces, narrow, thin, smooth, not generally continuous, with a small sharp short spine a little distance in front of the suture; spiral sculpture of, on the last whorl, about 20 sharply defined threads, mostly with wider interspaces, in which there are fine spiral striulae; there is a smooth space in front of the suture and another around the narrowly perforate umbilicus, without spiral sculpture; aperture ovoid; operculum blackish, concave, of about three whorls. Length, 12.5; diameter, 6 mm. U. S. Nat. Mus. Cat. No. 96821. Range, in the vicinity of La Paz, Lower California, in 10 to 45 fathoms.

EPITONIUM EMYDONESUS, new species.

Shell minute, white, with two smooth, polished, nuclear, and four and a half subsequent well-rounded whorls; varices 14, sharp, hardly reflected, not continuous over the suture, slightly crenulated by the spiral sculpture of distinct, close, rounded threads; base rounded, imperforate; aperture rounded. Length, 3.5; diameter, 1.7 mm. U. S. Nat. Mus. Cat. No. 194995. Range, Galapagos Islands, in 40 fathoms, sandy bottom.

EPITONIUM IMPERFORATUM, new species.

Shell small, white, with two polished nuclear and four or five subsequent rounded whorls with a deep suture and imperforate base; varices 20 or 21, low, narrow, with wider interspaces, not continuous over the suture, and having a small angle at the shoulder which gives a slightly turrited aspect to the spire; spiral sculpture of close-set similar spiral threads covering the whole surface between the varices; aperture ovate. Length, 4.5; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 211391. Range, off La Paz, Lower California, in 26 fathoms.

EPITONIUM ONCHODES, new species.

Shell minute, white, thin, with two smooth nuclear and four rapidly enlarging subsequent whorls; base minutely perforate; varices 19, thin, low, sharp, not spinose or continuous over the very deep suture; spiral sculpture of uniform, very fine, close-set threads covering the whole whorl between the varices; aperture obliquely ovate. Length, 3; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 211786*a*. Range, Panama Bay in 62 fathoms, sand.

EPITONIUM LAGUNARUM, new species.

Shell small, thin, white, with six rounded whorls exclusive of the (lost) nucleus; varices 16, low, narrow, widely spaced, passing over the entire whorl; spiral sculpture of extremely fine striae, with a single thread on the periphery and a stronger one, marginating the imperforate base, on which the suture is laid; aperture obliquely ovate, the margin slightly produced in front and near the suture. Length, 7.5; diameter, 3.5 mm. U. S. Nat. Mus. Cat. No. 253024. Range, Laguna Beach, California, J. J. White.

New section PICTOSCALA Dall.

In spite of the numerous sections proposed by M. de Boury, he does not seem to have designated one to receive shells of the type of *Scalaria lineata* Say, 1822 (not of Kiener, 1838). These forms have a more or less dark colored body with a feebly developed basal disk, fine spiral striation, rather numerous small varices, and a few irregularly distributed very much heavier varices, including the terminal one. A single species of this group occurs at Panama. In allusion to the coloration I propose *Pictoscala* for these forms.

EPITONIUM (PICTOSCALA) PURPURATUM, new species.

Shell small, dark purple, with seven well-rounded whorls, exclusive of the (lost) nucleus; minor varices linear, low, about 18 in number, major varices one or two, white and conspicuous; spiral sculpture extremely fine striae visible under magnification; base rounded, imperforate, the disk feebly marked; aperture ovate, the thickened margin nearly or quite interrupted over the body. Length, 10; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 252242. Range, beach at Old Panama, Doctor MacDonald.

Epitonium (*Cirsotrema?*) *montereyense* Dall, 1907, has 11 varices and ranges from Monterey to San Pedro, California.

The subgenus *Sthenorytis* Conrad, 1862, contains some of the most noble species of this family both recent and fossil. *Stenorhytis* Cossmann, 1912, is synonymous. *Pseudosthenorytis* Sacco, 1891, does not seem to differ materially. Only one species is yet known from the Pacific coast, *S. turbinum* Dall, 1908, from 300 fathoms, near the Galapagos Islands. It has 10 varices.

Coming now to the group which has no spiral sculpture, often referred to *Clathrus* Oken, 1815, and called by De Boury *Nitidoscala* in 1908, we find the Pacific coast well supplied with species. The most conspicuous of the northern ones is *E. indianorum* Carpenter, 1865, which has 12 to 13 varices and ranges from Forrester Island, Alaska, south to Todos Santos Bay, Lower California.

A similar but more slender shell, with usually 11 or 12 varices and a narrow, purple brown line in front of the suture, is *E. tinctum* Carpenter, 1865. I consider the species quite distinct from *indianorum* to which Carpenter referred it as a variety. It is notable that the brown line, so distinct in fresh specimens, gradually fades out in the cabinet, though kept in the dark. The range of this species is from Monterey to the Gulf of California.

In 1856 Carpenter described from Panama a species of *Nitidoscala* with eight varices, under the name of *S. hindsii*. By some confusion he transferred the name in 1865 to a well-known form from California which has 11 to 14 varices and ranges from Monterey to the Gulf of California, but so far as known does not reach Panama. For the Californian shell I propose the name of *Epitonium* (*Nitidoscala*) *fallaciosum*.

Other species are *E. subcoronatum* Carpenter, 1869 (*Spiniscala* De Boury, 1910), with 11 varices, ranging from Vancouver Island to San Diego; *E. acrostephanus* Dall, 1908, with 14 to 17 varices, ranging from Monterey to the Coronado Islands; and *E. crebricostatum* Carpenter, 1869, with 9 to 11 varices, ranging from Vancouver Island to the Gulf of California. This latter is not *S.* (*Funis*) *crebricostata* Stanley Gardner, 1876.

Undescribed forms related to the preceding are as follows:

EPITONIUM DENSICLATHRATUM, new species.

Shell white, solid, with 6 or 8 well-rounded whorls exclusive of the (lost) nucleus; varices 10 or 11, sharply axially grooved on their anterior faces, solid, thick, not continuous over the suture, on the base showing a slight flattening, though there is no basal cord or disk; aperture ovate; behind the inner margin there is a narrow flattened area reflected over the umbilical region in the type-specimen. Length, 17; diameter, 7.5 mm. U. S. Nat. Mus. Cat. No. 111209. Range, Puget Sound and Neeah Bay, Washington.

This form was segregated by Carpenter in the Stearns collection under the above name, but never published.

EPITONIUM PERSUTURUM, new species.

Shell with three smooth brown nuclear and five subsequent thin white whorls separated by an unusually deep suture; varices 10, narrow, rounded, continuous up the spire which they encircle about half way, but not expanded at the suture into which they dip; the whorls are slightly flattened above the shoulder, but there is no corresponding angle or spine on the varices. Length, 15.5; diameter, 6 mm. U. S. Nat. Mus. Cat. No. 211021. Range, beach at San Diego, California.

EPITONIUM COLPOICUM, new species.

Shell white, with one blunt nuclear and five subsequent, rapidly enlarging well-rounded whorls; varices nine, continuous over the suture, which is deep, and so expanded there as to form pit-like cavities of the interspaces; the varices are thin, sharp, rather wide, and hardly reflected; in ascending to the apex of the shell they nearly half encircle it; base rounded, imperforate; the terminal varix does not touch the body whorl and is buttressed by the anterior ends of the preceding varices. Length, 9; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 46213. Range, Gulf of California (Stearns).

EPITONIUM PAZIANUM, new species.

Shell chalky white, thin, smooth, with seven rounded, almost separated whorls exclusive of the (lost) nucleus; varices nine, thin, sharp, with a spinule at the shoulder, continuous over the suture into which they descend and making nearly half a turn around the spire before reaching the apex; base rounded, imperforate; aperture rounded, the inner anterior margin somewhat produced; the margin nowhere attached to the body whorl. Length, 20; diameter, 9 mm. U. S. Nat. Mus. Cat. No. 111208. Range, La Paz, Lower California, in 112 fathoms.

EPITONIUM HEXAGONUM Sowerby, 1844.

Has six varices, as its name implies, and this number seems invariable. The shell is pure white, the smoothness and regularity of its shape are very pleasing and give, together with its solidity, a special aspect to the species. It ranges from Santa Cruz, California (Button, collector) to Panama.

EPITONIUM PROPEHEXAGONUM, new species.

Shell of 10 whorls, livid flesh color with white varices, otherwise closely resembling *E. hexagonum* in form but larger; rarely with seven varices; first whorl of the nucleus small, smooth, white; second with 12 low rounded varices; subsequent whorls with the normal six continuous over the suture, half encircling the spire, finely striated on the anterior face, a slight angle at the shoulder but much less prominent than in *E. hexagonum*. Length, 21; diameter, 9.5 mm. U. S. Nat. Mus. Cat. No. 153075. Range, Gulf of California and Mazatlan.

Adult *hexagonum* measures about 14 mm. in length and 6 in diameter, and is relatively more acute with apparently deeper suture. The varical angle is only fully developed on the later whorls, when it is often spinose. The front of the varices is not striated.

EPITONIUM EUTAENIUM, new species.

Shell small, thin, slender, white, acute, with eight whorls, including the blunt smooth nucleus; varices eight, low, narrow, sharp, continuous over the deep suture into which they dip; a slight angle at the shoulder, the front face of the varices smooth; aperture transversely oval, the lateral margins slightly produced. Length, 11; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 201201. Range, Gulf of California.

EPITONIUM APICULATUM, new species.

Shell small, white, with a smooth slender elevated nucleus of two and a half whorls and five rapidly enlarging subsequent whorls; varices eight, sharp, high, thin, with an acute angle at the shoulder, continuous over the deep suture into which they dip, half encircling the spire; on the base the varical edges are flatly reflected; on the later whorls the shoulder angle becomes a prominent spine; aperture ovate, slightly produced in front. Length, 4; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 111219. Range, Lower California to Panama Bay, in 30 fathoms.

EPITONIUM COMPRADORA, new species.

Shell minute, white, with a very small acute nucleus of two and a half smooth whorls and five or more rapidly enlarging subsequent whorls separated by a rather deep suture; varices 13, with a blunt angle at the suture, giving the profile of the whorls a somewhat tabulate aspect; varices thin, sharp, erect; base rounded, aperture subovate, anterior faces of the varices smooth. Length, 4; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 105527. Range, Point Abreojos, Lower California, to the Gulf of California,

Possibly immature, but apparently distinct from the young of any of the allied species.

EPITONIUM CYLINDRICUM, new species.

Shell small, white, thin, subcylindrical, with five whorls exclusive of the (lost) nucleus; suture moderately deep; varices 13, low, thread-like, not continuous over the suture, not angulate; base evenly rounded, aperture subovate. Length, 4; diameter, 1.5 mm. U. S. Nat. Mus. Cat. No. 271037. Range, near La Paz, Lower California, in 21 fathoms.

EPITONIUM CENTRONIUM, new species.

Shell small, white, acute, slender, with three elevated smooth nuclear and about five subsequent whorls; suture deep; varices nine, thin, sharp, erect, with a spinose angle about halfway between the suture and the periphery, continuous over the suture on the spire which they nearly encircle; terminal varix duplex, anterior faces of the varices striated; aperture rounded, the inner margin buttressed by the preceding varices, not touching the body whorl. Length, 4.5; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 211395. Range, Gulf of California, in 7 to 26 fathoms.

EPITONIUM TIARA Carpenter, 1856.

This species has 12 varices and ranges from Catalina Island to Todos Santos Bay, Lower California, according to specimens so named by Carpenter in the Stearns collection. It was originally described from Panama, and I feel some doubt as to whether the Californian species is conspecific with that from Panama, but the question can only be settled by a comparison with the type in the British Museum.

EPITONIUM COLUMBIANUM, new species.

Shell acute, yellowish white, with nine whorls exclusive of the (lost) nucleus; varices 18, low, rounded, more or less striated, without any angulation, continuous over the suture into which they dip and nearly encircling the spire; the type-specimen has the interspaces more or less finely axially striated, but the southern specimens seem quite smooth; base and aperture rounded, the anterior margin of the latter slightly angular. Length, 21; diameter, 7.5 mm. U. S. Nat. Mus. Cat. No. 111211. Range, off the Columbia River, Oregon, in 27 fathoms, and south to Point Abreojos, Lower California, in 44 fathoms.

The most prominent characteristic of this species is the regularity of all its features. It is the largest of those species of the coast which have unarmed varices.

EPITONIUM SAWINAE Dall, 1907.

This species has 16 to 19 varices more or less flatly reflected on the base, and ranges from Vancouver Island to San Diego, California, and possibly to the Gulf of California.

EPITONIUM SAWINAE, variety? CATALINENSE, new variety.

Shell with a small three-whorled nucleus, smooth and white, and seven and a half subsequent whorls; varices 22 to 24, not spinose or angular, not regularly continuous over the suture, with the anterior faces of the varices finely lamellose or deeply striated. Base rounded with a minute umbilical perforation in the adult; aperture nearly circular. Length, 13.5; diameter, 6 mm. U. S. Nat. Mus. Cat. No. 109502. Range, off Catalina Island, California.

It differs from *sawinae* by the absence of angularity on and the greater number of the varices, and by the umbilical perforation.

EPITONIUM MONTEREYENSE, new species.

Shell small, white, rather solid, with six whorls, exclusive of the (lost) nucleus; varices 14, low, rather solid, striated, not angulated, largely continuous over the suture, encircling about one-fourth of the spire, widely flatly reflected on the base, the reflection covering at least half the interspace, the whole giving the effect of a disk though there is no basal disk or cord; aperture subovate, the anterior margin somewhat produced. Length, 6; diameter, 2.5 mm. U. S. Nat. Mus. Cat. No. 111217. Range, Monterey Bay, in 30 fathoms.

EPITONIUM CALIFORNICUM, new species.

Shell small, white, solid, with seven whorls and a very small brownish nucleus of a whorl and a half; varices 9 or 10, low, sharp, reflected, anteriorly axially striated, with a very small sharp spine at the shoulder; suture deep, the whorls almost separated, rounded; base rounded, imperforate; aperture short-ovate, its inner margin resting on the preceding varices, not touching the body of the whorl. Length, 10.5; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 201202. Range, San Miguel Island, California, to the Gulf of California.

EPITONIUM RECTILAMINATUM, new species.

Shell minute, whitish, with three polished blunt nuclear and four subsequent whorls; varices 18 or 19, low, uniform, straight, not continuous over the suture, with equal interspaces, sharp and erect; without angle or spine; base rounded, imperforate; aperture rounded, slightly oblique. Length, 3.5; diameter, 1 mm. U. S. Nat. Mus. Cat. No. 110430. Range, Monterey Harbor, California, in 12 fathoms, to the Gulf of California. A quite similar but more rapidly increasing species is found at the Galapagos Islands, in 634 fathoms, but the specimen is too immature to name.

EPITONIUM CAAMANOI Dall and Bartsch, 1910.

Has 12 varices rather broadly and flatly reflected and comes from Barkley Sound, Vancouver Island, in 7 to 10 fathoms.

EPITONIUM TABULATUM, new species.

Shell slender, acute, thin, dull white, with two and a half smooth nuclear and 12 or more subsequent whorls; varices 16, thin, sharp, well reflected, anteriorly striated, with a blunt angle at the shoulder, behind which the varix is somewhat concave, giving a tabulate profile to the whorls; the varices more than half encircle the spire, being continuous over the spire; in perfect specimens there is a very thin calcareous outer layer to the shell; base rounded, aperture rounded, the reflected margin narrow. Length, 18; diameter, 7.5 mm. U. S. Nat. Mus. Cat. No. 109569. Range, San Pedro, California, to the Coronado Islands.

The length given above is of the decollate type specimen of five whorls; the entire length, if perfect, would be about 25 mm. It is a *Crisposcala*.

EPITONIUM APPRESSICOSTATUM, new species.

Shell slender, acute, white, with two and a half smooth nuclear and six or seven subsequent whorls; varices 13, low, flat, closely appressed to the whorl, continuous over the suture and nearly half encircling the spire; suture moderately deep, base rounded, imperforate, aperture subovate, the margin slightly angular in front.

Length, 14; diameter, 4.5 mm. U. S. Nat. Mus. Cat. No. 59334. Range, Acapulco, Mexico.

EPITONIUM MUSIDORA, new species.

Shell thin, white, slender, with an acute spire and deep suture; varices 10 or 11, low, thin, sharp, slightly reflected, anteriorly smooth, continuing over the suture into which they dip, and making a nearly complete circuit of the spire; base rounded, aperture subovate; there is a slight broadening of the varix at the shoulder of the whorl, but no angulation. Length, 13; diameter, 5 mm. U. S. Nat. Mus. Cat. No. 201203. Range, San Diego to Panama.

EPITONIUM COLUMNELLA, new species.

Shell small, white, with about five whorls exclusive of the (lost) nucleus; the whorls rather rapidly enlarging; varices 11, high, thin, angular and spinose at the shoulder, and distinctly angular at the margin of the base, on which the reflected portion is distinctly flattened, but with no basal disk or cord; base imperforate, aperture rounded, the reflected margin produced at the shoulder and in front. Length, 2.75; diameter, 1.75 mm. U. S. Nat. Mus. Cat. No. 111220. Range, Panama Bay, in about 30 fathoms.

EPITONIUM BERRYI Dall, 1907.

This species has 22 varices without angles or spines and ranges from San Pedro Bay in 200 fathoms to San Diego in about 75 fathoms. It is of the type of the West Indian *E. inconspicuum* Sowerby, 1847, but much smaller.

EPITONIUM HABELI, new species.

Shell small, acute, conical, white, with five rounded whorls exclusive of the (lost) nucleus; varices 16, low, rather thick, not reflected or angular, continuous over the suture and making about half the circuit of the spire; upper whorls delicately spirally striate, the sculpture becoming obsolete on the fourth and entirely absent from the last whorl; base rounded, with a small umbilical perforation; aperture rounded, the reflected margin produced near the axis in front. Length, 7.5; diameter, 4 mm. U. S. Nat. Mus. Cat. No. 56055. Range, Galapagos Islands, collected by Dr. Simon Habel.

This species completely bridges the gap between *Asperiscala* and *Nitidoscala*.

EPITONIUM DIEGENSE, new species.

Shell minute, whitish, with five whorls exclusive of the (defective) nucleus; varices 11 to 12, sharply anteriorly striated, angular at the shoulder, continuous over the suture, and making about half the circuit of the spire; base rounded, imperforate; aperture subovate, the reflected margin angular at the shoulder. Length, 5; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 211904. Range, San Diego to La Paz, in 7 to 10 fathoms.

EPITONIUM TABOGENSE, new species.

Shell small, short, conic, white, with nearly three smooth nuclear and four or five subsequent whorls; varices 11, sharp, erect, not continuous over the suture, not angulated or spinose at the shoulder, anteriorly smooth; base rounded, imperforate; aperture subcircular, the thickened margin nearly interrupted over the body. Length, 3; diameter, 1:5 mm. U. S. Nat. Mus. Cat. No. 211786. Range, Panama Bay, near Taboga Island, in 62 fathoms.

EPITONIUM CATALINAE Dall, 1908.

Shell of moderate size, slender, whitish, with three smooth, brownish nuclear whorls and seven or more subsequent whorls; varices 14 or 15, angular or even subspinose above, tabulating the profile of the spire, below the shoulder flatly greatly expanded, the distal edge often coalescing with the next preceding varix, the base imperforate, aperture rounded. U. S. Nat. Mus. Cat. No. 198628. Range, Catalina Island to San Diego, California.

The varical margins being very thin are usually more or less broken, but a complete and perfect specimen would probably show a large percentage of coalescence nearly covering the later part of the shell proper. This species would be referred by De Boury to the section *Crisposcala.*

EPITONIUM REGUM, new species.

Shell small, whitish, acute, with three smooth nuclear and seven or more subsequent whorls; varices 19 to 20, strongly anteriorly striated, narrowly flatly reflected, continuous over the suture and making about half the circuit of the spire, the anterior faces of the varices slightly irregularly crenulated; they are sharply angulated at the shoulder, giving the profile a turriculate aspect; base rounded, imperforate; aperture rounded, the reflected margin narrow. Length of five whorls, 9; maximum diameter, 4; diameter at decollation, 0.8 mm. U. S. Nat. Mus. Cat. No. 206596. Range, off Point Reyes, in 61 fathoms; off San Diego, in 48 to 78 fathoms.

This species is of the same general type as *E. catalinae,* but has more numerous and less expanded varices, which are obsoletely crenated.

EPITONIUM ORCUTTIANUM, new species.

Shell small, white, acute, with two smooth, short nuclear and six subsequent whorls; varices 10 to 12, narrow, erect, with a narrow reflection and an angle or even a small spine at the shoulder, not continuous over the suture, the anterior surface smooth, the base imperforate. Length, 6.5; diameter, 3 mm. U. S. Nat. Mus. Cat. No. 273998. Range, San Diego Harbor, foot of Broadway, C. R. Orcutt.

EPITONIUM BIALATUM, new species.

Shell stout, short, white, with a flesh-colored peripheral band in the later whorls; two short, smooth nuclear and six subsequent whorls; varices seven or eight, white, solid, erect, with a produced angulation at the shoulder, smooth anteriorly, continuous over the suture and making about half the circuit of the spire; base imperforate, aperture subovate, the reflected margin broad and much produced at the shoulder and in front. Length, 15; diameter, 10 mm. U. S. Nat. Mus. Cat. No. 180798. Range, Gulf of California, near La Paz, in 10 fathoms, and West Mexico.

This is a specially well marked species, perhaps related to *E. statuminatum* Sowerby.

EPITONIUM ZEPHYRIUM, new species.

Shell white, polished, solid, conic, with about five whorls exclusive of the (lost) nucleus; varices, nine, low, continuous, and bridging the suture. encircling about one-third of the spire in ascending to the apex, with smooth interspaces; varices smooth in front and without spines or angulation; base rounded, imperforate, without disk or cord; aperture subovate with narrow margin somewhat expanded in front and at the suture. Length, 11.5; diameter, 6 mm. U. S. Nat. Mus. Cat. No. 56056. Range, San Diego, California.

EPITONIUM BASICUM, new species.

Shell white, with a brownish narrow band in front of the suture when fresh, with seven whorls exclusive of the (lost) nucleus; varices 11, low, rounded, cord-like, continuous over the suture into which they dip, and making nearly half a turn in ascending around the spire, one or two near the terminal are larger than the rest; interspaces smooth; base rounded, marginated by a strong cord, imperforate; aperture subovate, the margin narrow, somewhat patulous in front. Length, 15; diameter, 7 mm. U. S. Nat Mus. Cat. No. 56049. Range, Gulf of California to Panama.

EPITONIUM ROBERTI, new species.

Shell white, solid, rather short, with two smooth nuclear and six subsequent whorls; varices 13, smooth, low, erect, continuous over the suture into which they dip, and encircling about one-fourth of the spire in ascending to the apex; base rounded, imperforate, marginated by a slender not prominent cord; aperture subovate, with a narrow margin, slightly wider on the side of the axis; the varices on the later whorls are without angulation or spines, but on the early whorls a small spine is developed at the shoulder which in subsequent whorls becomes obsolete and finally lost. Length, 12; diameter, 6.5 mm. U. S. Nat. Mus. Cat. No. 46251. Range, Gulf of California, Dr. Robert E. C. Stearns.

EPITONIUM RHYTIDUM, new species.

Shell small, subcylindric, pinkish white, strongly sculptured, of about 10 whorls exclusive of the nucleus which is missing. The type specimen retains six whorls, rounded and with a deep suture; varices 18 or 19, low, rounded, crenate; whorls spirally sculptured with (on the last whorl seven or eight) flattish cords; base flattish, nearly smooth, imperforate, marginated by a strong cord; aperture rounded. Length of decollate type-specimen, 5.5; diameter, 2 mm. U. S. Nat. Mus. Cat. No. 207604. Range, Galapagos Islands, in 40 to 634 fathoms.

This little shell has a remarkable sculpture, recalling some Pyramidellids, none of which, however, have a reflected margin to the lip. It is probable that its habitat is in the shallower water, and the presence of the broken specimen in the deep water adventitious.

It is quite likely that among De Boury's numerous sections there is one (perhaps *Funiscala*) into which this would fit, but not having typical specimens of all of them for comparison I refrain from selecting a sectional name for it.

EPITONIUM ZETEKI, new species.

Shell small, white, thin, with about 8 whorls, the nucleus of about one and a half glassy rounded whorls (with a portion lost?); last whorl with obscure, close-set spiral striae, with no basal disk or cordon; whorls rounded, suture deep; there are 11 sharp, erect, rather low varices, smooth on the front with no spines or angles, descending into the suture and regularly continuous over the spire, which they about half encircle; aperture nearly circular, axis imperforate. Height, 6.0; maximum diameter, 3.0 mm. U. S. Nat. Mus. Cat. No. 324463. Range, Panama, collected by Mr. James Zetek.

This species is nearest to *xantusi* but is more solid, has continuous varices, less emphatic spiral sculpture, and increases more rapidly in diameter. The former has not been found at Panama

EPITONIUM IMBREX, new species.

Shell minute, white, thin, with six or more whorls, the nucleus eroded and the last whorl of the type-specimen incomplete; there is no spiral sculpture, basal disk, or cordon; on the last whorl are about 22 varices, thin, low, smooth, protractive behind at the suture, with a hint of angulation at the periphery and remarkably arcuate on the imperforate base; the varices are continuous, somewhat appressed at the suture, and encircle about one quarter of the spire. Height, 2.3; diameter of last whorl, 1.0 mm. U. S. Nat. Mus. Cat. No. 324464. Range, beach at Panama, James Zetek.

This little species has more varices in proportion to its size than any other thus far reported, and is remarkable for the sigmoid arcuation of the varices.

EPITONIUM THYLAX, new species.

Shell small, white, solid, with 8 sharp-edged solid continuous varices; nucleus conic with three smooth whorls; subsequent whorls seven, feebly spirally striate, needing strong magnification to make it out; varices not descending deeply into the suture, nearly parallel with the axis, without angulation or spines; there is no basal disk or cord, the aperture is ovate, the base imperforate. Height, 6.25; diameter, 2.6 mm. U. S. Nat. Mus. Cat. No. 324465. Range, beach at Panama, James Zetek.

This species except for its spiral striation recalls in miniature such forms as *cookeianum*, *hexagonum*, etc.

The following species are not represented in the collection of the United States National Museum.

SCALARIA ACICULINA Hinds, 1843.

This is a slender purple brown species with about 12 arcuate varices and 10 whorls. It is imperforate and the varices are not spinose at the shoulder. The shell is about 8.5 mm. long and is said to come from the west coast of Central America.

SCALARIA VULPINA Hinds, 1843.

This is about 6 mm. long with about 8 whorls of a reddish brown color, slender, acute, spirally striated, with a strong basal cord, and is said to come from the island of Quibo, Veragua, Central America. The figure suggests a resemblance to *S. retiporosa* Carpenter.

SCALARIA CRASSILABRIS Sowerby, 1847 (not of von Koenen, 1885).

Is probably a Philippine shell wrongly reported from Mazatlan.

SCALARIA GRACILIS Sowerby, 1844.

Was originally described as a Philippine shell, and its reference to the west coast of America is due to a misidentification. It is not *S. gracilis* A. Adams, 1862, nor of H. Adams, 1860, nor Verrill, 1880. It is the type of *Graciliscala* De Boury, 1909.

CIRSOTREMA FUNICULATA Carpenter, 1857 (not of Watson, 1883).

Has two spiral ribs on the base and 15 to 20 varices. It is described from Mazatlan and resembles *S. diadema* Sowerby, 1832, of the Galapagos fauna.

SCALARIA INDISTINCTA Sowerby, 1844.

Has fine spiral sculpture and many simple uniform axial varices. It is reported from San Blas and the Gulf of California.

SCALARIA MITRAEFORMIS Sowerby, 1844.

Was described from Guacomayo, Central America.

SCALARIA SUPRASTRIATA Carpenter, 1857.

From Mazatlan, has the whorls not touching, is imperforate, with acute spire. It has 12 acute varices and a small spine at the shoulder.

SCALARIA OBTUSA Sowerby, 1844.

From Santa Elena, Ecuador; is not the species so named from Panama by C. B. Adams.

SCALARIA REGULARIS Carpenter, 1856.

Has 9 whorls and 10 to 12 sharp varices. There is obsolete spiral sculpture on the early whorls. It is a Panama species.

SCALARIA CUMINGI Carpenter, 1856.

Was also described from Panama. It has 8 or 9 varices.

SCALARIA DIADEMA Sowerby, 1832.

Is a Galapagos species.

SCALARIA RARICOSTATA Carpenter, 1857.

From the Gulf of California; has 8 slender varices. It is *S. carpenteri,* Tapparone Canefri, 1876, not *raricosta* Lamarck, 1822, nor of Costa (1844?). It belongs to *Punctiscala* De Boury, 1890.

SCALARIA REFLEXA Carpenter, 1855.

From San Blas, has 5 varices, with spout-like or subtubular spines. This is referred to *Hirtoscala* Monterosato, 1890, by Cossmann.

SCALARIA STATUMINATA Sowerby, 1844.

Belongs to the general group which includes *Epitonium bialatum.* It was described from Payta, Peru. It is also reported from Panama Bay, near Taboga Island.

SCALARIA POLITA Sowerby, 1844.

Was described from Xipixapi, Ecuador, and is referred to *Longiscala* De Boury, 1910.

SCALARIA ELENENSIS Sowerby, 1844.

Came from Santa Elena, Ecuador.

SCALARIA PRINCIPALIS Pallas, 1774,

Of which *S. costulata* Kiener is a synonym, is reported from West Colombia, which is certainly erroneous. Gmelin states that it is a native of Coromandel, and Cossmann refers it to the Philippines. The west Colombian shell is *ducalis* Mörch, 1876, and was named by Tapparone Canefri *S. simillima* in the same year.

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NOTES ON THE SPECIES OF THE MOLLUSCAN SUBGENUS NUCELLA INHABITING THE NORTHWEST COAST OF AMERICA AND ADJACENT REGIONS

THE LIBRARY

BY

WILLIAM HEALEY DALL

Curator of Mollusks, United States National Museum

No. 2124.—From the Proceedings of the United States National Museum,
Vol. 49, pages 557–572, with Plates 74–75

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By William Healey Dall.

Curator of Mollusks, United States National Museum.

The species of *Nucella* Bolten, more familiarly known as *Purpura* but not the *Purpura* of the classical writers nor of Martyn in 1784, are so far as known confined to the Northern Hemisphere, and flourish especially in its cooler waters, some species extending their range nearly to the Arctic Circle. The type of the subgenus is the solitary North Atlantic species *N. lapillus* of Linnaeus, the genus *Thais* Bolten, covering both the northern and tropical groups. The synonymy has been exhaustively treated in another publication.[1] The history of *N. lapillus* has been worked up by the Rev. Dr. A. H. Cooke in a recent paper[2] and he included a notice of the Pacific species, the synonymy of which had been previously considered by Vanatta.[3]

The very rich series of these shells contained in the United States National Museum and the doubts expressed as to the relations of several of the nominal species suggested that a review of the North Pacific forms might properly supplement Doctor Cooke's admirable paper on the Atlantic species.

The nucleus of the northern species of *Nucella* is smooth, white, slightly gibbous, with an apical dimple and one and a half whorls. No essential variation from this type has been noted in any of the species. In adults it has generally been lost through attrition. The extreme tip is bulbous and relatively large. The transition from the nuclear to the adolescent stage is abrupt, the newer surfaces taking on at once, above the suture, two or three strong spiral ridges.

The nucleus of the tropical species is different. It is very difficult to obtain specimens in which it is intact, even in the very young.

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[1] U. S. Geological Survey, Professional Paper No. 59, Washington, 1909, pp. 46–51.

[2] Proceedings of the Malacozoological Society of London, vol. 11, 1915, pp. 192–209.

[3] The Nautilus, vol. 24, 1910, pp. 37–38.

Proceedings U. S. National Museum, Vol. 49—No. 2124.

In the instances when I was able to detect it the color was invariably reddish brown. Instead of the bulbous, slightly irregular nucleus noted in *Nucella*, *Thais biserialis* has a regular, somewhat dome-shaped nuclear spire, with very minute apical portion and two and a half regularly coiled smooth whorls. *Patellipurpura patula* has the nuclear spire elevated and trochiform, the apex very minute and whitish, the remainder dark reddish brown, smooth and polished; in all about four and a half whorls. *T. columellaris*, though not so well preserved, seems to have a similar nucleus. In all cases the transition between the nucleus and the adolescent sculpture is abrupt.

The sculpture in *Nucella* may be axial or spiral or both. It may be entirely obsolete over the greater part of the shell, but no matter how smooth the latter appears there are always traces of the spiral ridges which immediately follow the smooth nuclear portion, provided the apical part of the specimen is not worn.

The spiral ridges of the nepionic shell between the sutures are persistent in sculptured specimens. They increase by intercalation, and the number of major ridges is quite constant in each species; the differences arising largely from the close or lax coiling of the whorls, which may sometimes leave exposed ridges which are usually hidden under the suture. Between the major ridges there are frequently numerous minor threads which are irregular in number and strength. In rare cases one or more major ridges will split into two or more small ones, which do not materially differ from the minor threads in size or appearance, but usually the discrimination between the two classes is not difficult.

Beside the regular threads on *N. lamellosa* there are fine, almost microscopic, more or less obsolete spiral striations, which are hardly perceptible except in specimens entirely free from surface erosion.

In one variety of *N. canaliculata* the major spirals are, as it were, flattened down until the interspaces are reduced to sharply incised lines, and the shell exhibits a very marked contrast to the variety with elevated ridges and channeled interspaces which Middendorff named *decemcostata*. But there are intermediate variations.

In some mutations, while one or two major spirals persist near the periphery of the whorls, the space between them and the preceding suture will be flattened, giving a conical aspect to the whorls. In others the spiral sculpture, after the first nepionic turn or two, may have become quite obsolete, the whorls inflated, and the sutures deep, giving the shell the aspect of a *Chrysodomus*. The axial sculpture in *lamellosa* usually takes the form of elevated sharp lamellae crenulated by their intersection with the major spirals. In some cases the lamellae are low except where they cross the spirals, and in a few instances they may take the form of fine low close imbrications such as characterize the form *imbricata* of the Atlantic *N. lapillus*.

In the other northwest coast species the lamellations do not become marked; in extreme cases they convey the impression of low close imbrication, or they may be reduced to mere elevated lines or even be altogether absent.

In only one of the species, *N. emarginata*, do we find nodulation of the spirals, and this not accompanied by any axial ribbing.

The suture is simple and closely appressed in this group, though the proximity of an elevated spiral, as in *N. canaliculata* gives the shell an aspect of being channeled at the suture.

The whorls are usually of a moderate convexity modified in particular instances by the external sculpture. There is little variation in their numbers within the species; it frequently happens that the short stumpy specimens and the slender elevated ones prove on examination to have the same number of post-nuclear whorls. The variation between specimens fully adult and of the same general type rarely exceeds one whorl, and that toward the apex of the shell. In coiling there is great variation more or less correlated with environment.

The sheltered rocky beaches of a well-protected harbor will afford slender elongated and lamellose specimens with small apertures. The outer rocks exposed to the ocean surf have short-spired, relatively smooth, wide-mouthed shells, which afford the least leverage to the waves. For, washed from his perch and carried to the muddy bottom off the shore by the undertow, an adult *Nucella* can hardly survive; and those offering the least friction and having the stronger hold on their situs are most likely to survive. There is also a connection between the situs and the shell which is less easily explained, and that is that, on rough surfaces such as an "oyster reef," or bar, the specimens of *lamellosa* are almost unanimously rough and laminate, while in undisturbed water on rocks with sandy surroundings the finest and most delicate development of lamellae and crenulations is to be found, according to the reports of collectors. In all cases *Nucella* seems to prefer a rocky habitat, especially if it affords young oysters or other sessile or sluggish species serving it as food.

The siphonal fasciole in these shells is usually strong, with the callus of the pillar lip folded over the inner half of its cavity. The elevation or depression of the shell seems to have no effect on the axis of the pillar, but occasional specimens, usually old and more or less pathologic, show a decided umbilical chink. The canal in well-developed specimens is rather strongly recurved.

The aperture in all the species, when mature, is margined by a continuous callus, sometimes thin and closely appressed, but in solid and heavy specimens thick, with an elevated edge on the body and pillar. The outer lip, while hardly reflected, has a certain flare and is slightly expanded. The pillar lip is smooth and in exceptionally developed specimens of *lamellosa* there is an obscure thickening on the middle of the pillar. Well within the aperture in this species, when well developed, is a group of three (or occasionally four) teeth separated by a marked gap from the posterior sinus of the aperture, and by a less conspicuous gap from two more or less dentiform nodulations near the constriction at the proximal end of the canal. Many apparently well-developed individuals, however, show no trace of denticulation. For a long time it was supposed that *N. lamellosa* was the only west coast species developing teeth, but Miss Bertha M. Challis by careful search has found individuals of other species which also do so. As a general rule, however, it may be stated that the development of teeth in these northwest coast species is much less constant than in the North Atlantic *N. lapillus.*

The coloration of the shell varies in all the species. In most specimens of *lamellosa* it is uniform over the entire individual and ranges from pure white through various shades of yellow and yellowish brown to a very dark brown. Specimens from quiet water are frequently of a gray or greenish gray from an algal deposit which when removed shows the true color of the shell. Some specimens have a white band at or slightly below the periphery, but any breaking up of the other colored areas by additional white spiral bands is extremely rare.

This species never shows flammulation or banding of a darker or different color. The margin of the aperture is generally pale, the throat darker, brownish, or purplish brown in dark specimens; white or slightly yellowish in white specimens.

In *N. canaliculata* the range of coloration is about the same, except that when banded there are usually two white bands, one near the periphery and one on the base, and the resulting brown bands are frequently broken up into patches or flammulations by gaps of paler or whitish color. The outer lip is usually crenulated at the edge by the exterior sculpture, and the interspaces between the spirals are more or less reticulated by close-set axial elevated lines. The production of teeth in this species is rare; when present, following a posterior smooth space, there is a continuous line of eight or nine small teeth to the beginning of the canal. In *N. lima* the color characteristics are much the same as in *N. canaliculata,* though it is rarely flammulate; but, even in the heaviest and most callous adults, I have not been able to detect any trace of denticulation in the aperture.

In *N. emarginata* the most conspicuous feature, after the nodulation of the spiral bands, is (except in unicolored specimens) the presence of narrow, usually dark-brown bands between the lighter colored, usually white, major spirals. None of the other species has this feature. While the nodules are sometimes subspinose, there is never any prominent axial lamellation. The pillar is conspicuously concavely arched, and there are occasionally from three to eight obscure denticulations within the outer lip. The colors range about the same as in the other species, but there seem to be fewer light colored and more melanitic specimens. The proportion of unicolored individuals is markedly less.

The operculum throughout the group has the usual characters belonging to the genus. It seems to be rather larger, in proportion to the aperture, and perhaps generally darker in color in *N. emarginata* and smaller and paler in *N. lamellosa* than in the other two species.

Thinking that the major spirals might afford some specific characters, all the specimens in the collection were subjected to a careful count, 1,753 in all. The count was taken at the end of the penultimate whorl from the commissure of the outer lip with the body whorl to the suture behind. Only adult specimens were included in the count.

Of 529 specimens of *N. emarginata* 433 had two, 78 had only one, and 18 had three major spirals. The intercalary spiral threads in the whole space between the sutures varied from none to three, 290 specimens having none, 118 having one, 109 having two, and 12 having three.

Of 315 specimens of *N. lima* 110 had three major spirals, 130 had four, 71 had five, 2 had six, and 2 had seven. Of intercalary threads two had none, 135 had three, 114 had four, 31 had five, and 3 had six.

Of 363 specimens of *N. canaliculata* 27 had three major spirals, 135 had four, 136 had five, 63 had six, 1 had seven, and 1 had eight. Of intercalary threads, 112 had none, 6 had one, 43 had two, 57 had three, 78 had four, 56 had five, 7 had six, and 4 had seven.

Of 549 specimens of *N. lamellosa* 32 had one major spiral, 417 had two, 4 had three, and 2 had four. On the last whorl 368 had nine major spirals and the others varied from one to thirteen.

Of 21 specimens of *N. freycinetii* 18 had two major spirals and the others three. The intercalaries varied from two to five; but the number of specimens being so restricted, the result in this case is not conclusive.

If these figures for the major spirals be platted, it will be evident that the profile of the curve for each species has its own characteristics, and it is quite possible that the few scattering exceptions to the rule may be due to hybridization.

The species of *Nucella* are in the main carnivorous, and have been observed by me to feed on small bivalves like *Anomia*, on Ascidian colonies, and on the ovicapsules of their own and other species of gastropods. In scraping off other small invertebrates from kelp and rockweeds it is probable they swallow a certain amount of vegetable matter, and on one occasion I found several feeding on the rather putrid body of a dead fish. Yet I have never observed them attacking other mollusks in which the shell had attained a certain degree of solidity, and conclude that they confine their predatory work to animals and substances only moderately well protected from such attacks.

These animals prefer a rocky habitat, especially one well covered with fucus, underneath which they remain concealed, and they are rarely seen exposed to the glare of the sun. They occur from the vicinity of high-water mark to a depth of several feet below low water, and have been dredged from a considerably greater depth, in one case in over 60 fathoms. But these specimens are usually not living, and their presence at such a depth can be ascribed to accident, such as the disgorging of a recently swallowed shell by a fish, or washing from their actual situs by the surf. Some species, like *N. lamellosa*, appear to frequent banks of rock or coarse gravel which are rarely uncovered by the tide and yet are favorite haunts of barnacles, and of oysters, anomias, and other rough bivalves upon whose young the *Nucella* feeds. The smaller species, like *emarginata*, seem to prefer the rocks covered with bladder-weed along shore.

I have not observed *Nucella* among the shells in the aboriginal middens of the Alaskan coast, nor are they eaten by the natives at the present time, although abundant enough to form an article of food. Jeffreys states that the British species is found in some of the Pictish middens, and that it is destructive to mussels and limpets, but on the Alaskan coast during many years collecting I have never found a drilled limpet shell or a *Nucella* attacking any but very young mussels.

The ovicapsules are abundant in early spring and, like those of the tribe elsewhere, are elongate slender yellowish vaselike objects of a parchmentlike texture, with a flat circular top, and are mounted on slender cylindrical peduncles in groups on rocks or dead bivalves.

The young, of which a considerable number occur in a single capsule, are cannibals, the weaker ones being devoured by their brethren while still in the capsule, from which the survivors emerge at the top, leaving the vase unsealed. The adults also browse on the capsules, which are easily cut through by the sharp teeth of the radula.

Like the other species, these produce a purple dye, which I tested on an old handkerchief. It gave a dull purple color, which faded badly; but I afterwards learned that it could be made permanent by the addition of lemon juice, which is used with the purple of the tropical species by the natives of Central America and Peru. However, I have never seen any articles dyed with this substance which had any brilliancy or attractiveness of tint. If the classical descriptions of the Tyrian dye are correct, the American purple can not compete with it.

Jeffreys says that the fluid contained in the *N. lapillus* ovicapsules is also purpuriferous (besides having a disagreeable peppery taste), and I have noticed in Alaska that the brownish-yellow groups of capsules sometimes have a purplish tinge. In the animals themselves the secretion bears no comparison in amount or color with that afforded by the tropical species, especially *Patellipurpura*.

THAIS (NUCELLA) LAMELLOSA Gmelin.

Plate 74, figs. 5–8.

Buccinum plicatum MARTYN, Univ. Conch., 1784, fig. 44; not of Linnaeus, Syst. Nat., ed. 10, 1758, p. 735.

Buccinum compositum CHEMNITZ, Conch. Cab., vol. 10, 1788, p. 179, vign. 21, figs. *a*, *b* (nomenclature not Linnean).

Buccinum crispatum CHEMNITZ, Conch. Cab., vol. 11, 1795, pp. 70, 84, pl. 187, fig. 1802–1803, (nomenclature not Linnean).—DILLWYN, Recent Shells, vol. 2, 1817, p. 613; not of Solander in Dillwyn, vol. 2, p. 707.

Buccinum lamellosum GMELIN, Syst. Nat., vol. 7, 1792, p. 3498.—DILLWYN, Recent Shells, vol. 2, 1817, p. 612.

Buccinum lamellosum BOLTEN, Mus. Bolt., ed. 1, 1798, p. 113, Nos. 1462–1463 (23); ed. 2, 1819, p. 80, Nos. 1435–1436 (23), pl. 1, fig. 4.

Polyplex rugosus PERRY, Conch., 1811, pl. 9, fig. 2.

Murex crispatus LAMARCK, Anim. s. Vert., vol. 7, 1822, p. 174; Encycl. Meth., 1816, pl. 492, fig. 2; Deshayes' Lamarck, Anim. sans Vert., vol. 9, 1845, p. 576.

Murex ferrugineus ESCHSCHOLTZ, Zool. Atlas, pt. 1, 1829, p. 10, pl. 9, figs. 2 *A–B*.

Murex lactuca ESCHSCHOLTZ, Zool. Atlas, pt. 1, 1829, p. 11, pl. 9, figs. 3 *A–B;* not of Bolten, Mus. Bolt., 1798, p. 141, as *Purpura* (=*Murex saxatilis* Linnaeus, Syst. Nat., ed. 10, 1758, p. 747; +*Purpura saxatilis* Meuschen, 1787).

Polytropa crispata SWAINSON, Malac., 1840, p. 305.

Purpura septentrionalis REEVE, Conch. Icon., vol. 3, 1846, *Purpura*, pl. 10, fig. 50.—MIDDENDORFF, Beitr. Mal. Ross., vol. 2, 1849, p. 117.

Murex lactuca MIDDENDORFF, Beitr. Mal. Ross., vol. 2, 1849, p. 120, pl. 7, figs. 1, 2.—FISCHER in Pinart, Voy. Côte N. W. de l'Amer., 1875, p. 38, pl. E, figs. 4, 4*a*.

Purpura crispata CARPENTER, Rep. Brit. Assoc. for 1863, p. 662, 1864 (Smithsonian reprint 1872, p. 148).—ARNOLD, Pal. San Pedro, 1903, p. 261.

Purpura plicata MARTENS, Mal. Blätt., vol. 19, 1872, p. 86.

Purpura lapillus var. *crispata* TRYON, Man., vol. 2, 1880, pp. 171–229, pl. 54, figs. 163–166.

Thais (*Nucella*) *lamellosa* DALL, Prof. Paper, No. 59, U. S. Geol. Survey, 1909, p. 80.

Thais plicata VANATTA, Nautilus, vol. 24, No. 4, 1910, p. 37.—COOKE, Proc. Mal. Soc., vol. 11, pt. 4, 1915, p. 203.

? *Purpura lapillus* var. *quillayutea* REAGAN, Trans. Kansas Acad. Sci., vol. 22, Geol. ser., 1909, p. 221, pl. 6, figs. *a–b*.

Range.—Bering Strait at Port Clarence; south on the west to the Japan Sea off Sado Island in 161 fathoms (dead); on the east to the Aleutian Islands and to Cook's Inlet, Oregon, and Santa Barbara, California. Pleistocene of California and Oregon. Pliocene of San Diego and San Mateo Counties, California, and Clallam County, Washington.

This species submits to such changes, incident to situs, that single specimens, or even numerous specimens from single localities, might well be taken for different species, especially as specimens from a single locality often exhibit a singular uniformity of characters, even in factors which would seem not likely to be subject to influences of the environment, such as the number of the major spirals. These uniformities are probably due to inheritance from common ancestors. The only way to get a broad view of the range of characters is to have not only many specimens but specimens from many localities. Then the gradations can be recognized in a way not otherwise possible.

There are some of these forms which exhibit characteristics of a uniformity which entitles them to be called varieties, irrespective of the differences due to color-variation, and other mutations.

THAIS LAMELLOSA Gmelin, typical form.

Type locality (to which it is by no means confined) Nootka Sound, Vancouver Island.

Shell large, heavy, with a conic spire shorter than the aperture in most specimens, prominently laminated with from 9 to 20 sharp-edged elevated lamellae, crenulated and produced where they intersect a major spiral; on the penultimate whorl there are two, on the last whorl seven to nine major and an indeterminate number of minor spirals, the former most prominent near the shoulder of the whorl, diminishing in size and more adjacent progressively toward the canal; aperture large, the outer lip flaring, the throat sometimes dentate, the umbilical chink usually sealed by callus (63873).

In the following measurements in millimeters the nucleus is not included:

Measurements.

TYPICAL FORM.

Whorls.	Height of shell.	Height of last whorl.	Breadth.
6	72	54	38
6	81	65	46
7	86	57	42

LAMINATE FORM.

Whorls.	Height of shell.	Height of last whorl.	Breadth.
4	40	35	26
4½	38	34	27
5	39	32	28.5

SMOOTH FORM (60125).

4	46	41	32
4½	48	42	30
4½	30	31	24

THAIS LAMELLOSA, new variety FRANCISCANA.

San Francisco Bay.

Shell subfusiform, heavy, with a subconic spire shorter than the aperture, laminae reduced to obsolete low imbrications or usually none; whorls flattened behind the shoulder; major spirals low, feeble, two on the penultimate whorl, seven or more on the last whorl, minor spirals obsolete or none; aperture large, the outer lip flaring, umbilical chink usually distinct but closed (63909).

Measurements.

Whorls.	Height of shell.	Height of last whorl.	Breadth.
4½	50	40	28
4½	52	41	29
5	51	42	29

THAIS LAMELLOSA, new variety HORMICA.

Inner part of Sitka Harbor, Alaska.

Shell of smaller size than either of the preceding, thin, with spire subacute, produced, longer than the aperture; whorls angular with more or less prominent axial laminae, 10 or more to the last whorl, often produced at the angles into guttered spines; major spirals two on the penultimate, five or six on the last whorl; aperture small, the outer lip hardly expanded, only moderately callous; the umbilical chink usually obsolete (88862).

Measurements.

Whorls.	Height of shell.	Height of last whorl.	Breadth.
6	48	30	21
6	53	34	25
6½	48	32	20

THAIS LAMELLOSA, new variety NEPTUNEA.

Cook Inlet.

Shell large, heavy, smooth, with rounded whorls and deep though appressed sutures, resembling a very thick and heavy *Chrysodomus*.

The measurements are about the same as in the typical form.

THAIS LAMELLOSA, new variety CYMICA.

Typical locality: Rocks exposed to the surf, coast of Washington.

Shell short, robust, heavy, very thick, spire short-conic, shorter than the aperture, one mutation being sparsely laminate, the other with a smooth surface; whorls flattened behind the shoulder; major spirals obsolete or none; when present, there is one on the penultimate whorl and five or six on the last whorl; aperture large, outer lip flaring, umbilical chink usually concealed by the callus.

THAIS LAMELLOSA, new variety SITKANA.

Inner harbor of Sitka, Alaska.

Shell resembling var. *hormica*, but smaller and thinner, the spire produced, subacute, longer than the aperture; whorls rounded, with no lamination; major spirals conspicuous, two on the penultimate, five or six on the last whorl; aperture small, outer lip not reflected, usually with a deep umbilical chink.

Measurements.

Whorls.	Height of shell.	Height of last whorl.	Breadth.
4½	36	24	17
4½	36	24	17
5	38	25	18

If names were given to mutations such as color markings, etc., the number might be indefinitely increased. All the varieties seem to run through the same gamut of color, and to have banded mutations. I have not been able to satisfy myself as to the existence of differences in the shell due to sex, but the subject requires further study.

THAIS (NUCELLA) LIMA Martyn.

Plate 75, figs. 4–6.

Buccinum lima Martyn, Univ. Conch., vol. 2, 1784, pl. 46.

Purpura saxicola Valenciennes, Voy. *Venus*, Atlas, 1846, p. 4, pl. 8, figs. 4, 4*a*.

Purpura attenuata Reeve, Conch. Icon., vol. 3, September, 1846, *Purpura*, pl. 10, fig. 49.

Purpura freycinetii (part), Middendorff, Sib. Reise, vol. 2, 1851, p. 219, pl. 12, figs. 5–9 (not of Deshayes, 1839); also in Beitr. Mal. Ross, 1849, p. 117.

Purpura canaliculata et saxicola (part), Carpenter, Rep. Brit. Assoc., for 1863, p. 662, 1864. (Smithsonian reprint, 1872, p. 148.)

Purpura lapillus var. Tryon, Man., vol. 2, 1880, p. 175; not of Linnaeus.

Purpura lima (part), Taylor, Trans. Roy. Soc. of Canada, ser. 2, sect. 4, 1895, p. 72.

Thais lima Vanatta (syn. excl.) Nautilus, vol. 24, August, 1910, p. 37.—Keep, W. Coast Shells, 1911, p. 180, fig. 169.

Purpura lima Cooke (syn. excl.) Proc. Mal. Soc. London, vol. 11, pt. 4, 1915, p. 203.

Range.—From Kotzebue Sound, Arctic Ocean, south to Bering Strait and on the west to Bering Island, Kamchatka, the Kuriles and Japan. On the east to the Aleutian Islands, southeastern Alaska to California at Monterey, San Pedro Point, San Diego, and off Lower California on Cerros Island.

Shell of three and a half to four rounded whorls, not including the nucleus; moderately thick with a spire much shorter than the aperture, the last whorl much the largest; with a tolerably uniform spiral sculpture of alternated major and minor spiral cords; aperture large, outer lip not reflected and seldom thickened, more or less crenulated by the sculpture; pillar slightly arcuate, flattened anteriorly, the canal narrow and curved to the left; umbilicus sometimes sealed, at others showing a deep narrow perforation behind the callus of the reflected pillar.

Type locality, Nootka Sound.

Measurements.

Whorls.	Height of shell.	Height of last whorl.	Breadth.
3½	43	40	30
3½	50	45	30
3½	60	54	36

THAIS (NUCELLA) CANALICULATA Duclos.

Plate 74, figs. 1–4.

Purpura canaliculata Duclos, Ann. Sci. Nat., vol. 26, Mai, 1832, p. 104, pl. 1, fig.1 , California.—Humboldt and Bonpland, Recueil d'obs. de Zool., vol. 2, 1832, p. 316.

Purpura analoga Forbes, Proc. Zool. Soc. London, 1850, p. 273, pl. 11, fig. 12, California.

Purpura decemcostata Middendorff, Beitr. Mal. Rossica, vol. 2, 1849, p. 116, pl. 9, figs. 1–3.

Purpura lapillus var. *beringiana* Middendorff, Sib. Reise, vol. 2, 1851, pt. 1, p. 222, pl. 12, figs. 10, 11 (only), Okhotsk Sea.

Purpura freycinetii Middendorff, (part) Beitr. Mal. Ross., 1849, p. 117.

Purpura canaliculata Carpenter, Rep. Brit. Assoc., for 1863, p. 662, 1864 (Smithsonian reprint, 1872, p. 148), (syn. ex. parte excl.); Puget Sound to San Francisco, California.

Purpura lapillus var. Tryon, Man., vol. 2, 1880, p. 175, pl. 53, fig. 156.

Purpura lima, (*part*), Taylor, Trans. Roy. Soc. Canada, ser. 2, vol. 1, sect. 4. 1895, p. 72, not of Martyn, 1784.—Vanatta, Nautilus, vol. 24, No. 4, August, 1910, p. 37.—Keep, W. Coast Shells, 1911, p. 180, fig. 169.—Cooke, Proc. Mal. Soc. London, vol. 11, pt. 4, March, 1915, p. 203.

Range.—Aleutian chain from Attu eastward to Sitka and southward to Puget Sound and Monterey, California.

This species has been confounded with *Thais lima* by several authors and with *T. freycinetii* by others. Tryon, as usual, "lumps it" with *T. lapillus.* The reasons for considering it distinct will follow later.

At the same time that this species was described by Forbes under the name of *analoga* another species was named *fuscata,* figured, and said to come from the Hawaiian Islands. Carpenter in his report of 1864 says the types of *fuscata* in the British Museum comprise one brown and one immature white specimen, which he describes as a "large smooth rather elevated variety of *saxicola*" (p. 592). This does not at all agree with Forbes's figure. On the other hand, Cooke (p. 204) states that "The type of *fuscata* is the larger of two specimens in the British Museum, collected by Captain Kellett and

Lieutenant Wood, R. N. * * * The spire is elevated and the spiral ridges well marked." This is probably correct; at any rate, the observations on the species here made are based on the supposed accuracy of the figure in the Proceedings of the Zoological Society.

The figure is excellent and portrays a shell with two strong spiral ribs on the penultimate whorl separated by deep axially threaded channels. On the last whorl there are six of these ribs. The aperture is about one-fifth longer than the spire. No species with these characters is known from the northwest coast. The Hawaiian Islands have long been known for the great number of shells from all parts of the Pacific brought there by whalers and traders, many of which in the literature have erroneously been supposed to form part of the fauna of the Hawaiian group. The figure of the *Purpura fuscata* of Forbes agrees almost exactly with the Indo-Pacific species named by Velain *P. dumasi* variety *cincta*,[1] and I have a suspicion it is either that or a closely related Indo-Pacific species.

THAIS CANALICULATA, typical form.

Type locality, "California."

Shell bucciniform, of three and a half to four rounded whorls exclusive of the nucleus, moderately thick, with a spire about one-half shorter than the aperture, the last whorl largest, with a very uniform sculpture of strong elevated spiral ridges separated by distinctly channeled interspaces crossed by small slightly elevated axial lamellae or elevated lines; minor spirals very rarely occur; there are 4 to 6 major spirals on the penultimate whorl and about 10 on the last whorl; outer lip not reflected and only slightly thickened, usually crenulated by the external sculpture; pillar moderately arcuate, flattened in front where the callus conceals but does not seal a long narrow umbilical chink; canal narrow, recurved (220973).

Measurements.

Whorls.	Height of shell.	Height of last whorl.	Height of aperture.	Breadth.
3¾	34	27	20	18
4	40	30	21	20
4	41	33	23	23

THAIS CANALICULATA, var. ANALOGA Forbes.

"California."

Similar to the preceding but stouter, usually with one more whorl, and with a minor spiral regularly intercalated between the major spirals.

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[1] Arch. Zool. Exper., vol. 6, 1876, p. 102, pl. 2, fig. 15.

Measurements.

Whorls.	Height of shell.	Height of last whorl.	Height of aperture.	Breadth.
4½	43	36.0	28.0	27
4½	46	36.5	25.0	25
4½	47	37.0	27.5	27

THAIS CANALICULATA, new variety COMPRESSA.

Monterey, California (60102).

Shell similar to the typical form but with the elevated ridges or major spirals flattened down until the interspaces become almost linear. There are 6 or 7 on the penultimate whorl and 12 or 13 on the last whorl.

Measurements.

Whorls.	Height of shell.	Height of last whorl.	Height of aperture.	Breadth.
3⅓	36	30	24	21.5
3½	38	34	25	23.0
4	34	29	23	22.0

THAIS (NUCELLA) EMARGINATA Deshayes.

Plate 75, figs. 1–3.

? *Purpura lagenaria* Duclos, Ann. Sci. Nat., vol. 26, Mai, 1832, p. 112, pl. 2, fig. 11; not of Lamarck, 1822.

? *Purpura rupestris* Valenciennes, Voy. *Venus*, Atlas, 1846, pl. 9, fig. 1, *a–b*, (Magnified figure.)

Purpura emarginata Deshayes, Rev. Zool. Soc. Cuv., 1839, p. 360; Mag. de Zool. (Guerin), 1841, pl. 25. (Pathologic.)

Purpura lapillus var. *anomala* Middendorff, Beitr. Mal. Ross., vol. 2, 1849, p. 115, pl. 9, figs. 4, 5 (only).

Purpura emarginata Reeve, Conch. Icon., vol. 3, *Purpura*, 1846, pl. 10, fig. 46.—Cooke, Proc. Mal. Soc. London, vol. 11, 1915, p. 203.

Purpura conradi (Nuttall MS.) Reeve, Conch. Icon., vol. 3, 1846, in synonymy.

Purpura saxicola var. Carpenter, Rep. Brit. Assoc., for 1863, p. 662, 1864 (Smithsonian reprint, 1872, p. 148). Not of Valenciennes.

Purpura ostrina Gould, U. S. Expl. Exped., Mollusca, 1852, p. 244; Atlas, 1857, pl. 18, figs. 310 *a*, *b*. Oregon.

Purpura saxicola Taylor, Trans. Roy. Soc. Canada, ser. 2, vol. 1, sect. 4, 1895, p. 72. Not of Valenciennes.

Thais emarginata Vanatta, Nautilus, vol. 24, No. 4, 1910, p. 37 (syn. exclus.).

Thais saxicola Keep, West Coast Shells, 1911, p. 179, fig. 168.

Range.—Bering Island and the Okhotsk Sea on the west. On the east Hagemeister Island and Bering Sea south of the winter floeline, and southeastward to California; Cerros Island, Lower California; Mazatlan and Topolobampo, Mexico.

The first two figures named in the above synonymy have a remarkable likeness to some smooth varieties of the present species. Tryon refers the first to *P. scobina* Quoy, from New Zealand and the Cape of Good Hope, but some of his other combinations are not so happy that they lead to much reliance on his opinion in this case.

The name *emarginata* is founded on a pathological feature of the type specimen, yet it is not obnoxious enough to make it necessary to reject it solely on that account. How Carpenter came to identify this species with *saxicola* of Valenciennes is a puzzle; the original figure of the latter is clearly a form of *Thais lima*, exactly duplicated by many specimens from the Northwest in our collection. The reference of *saxicola* to *T. freycinetii* is more reasonable, as the relations between that species and *T. lima* are very close, if indeed *freycinetii* is more than a subspecies of *T. lima*.

The original locality, as for many west coast shells, is given as "New Zealand." As this is erroneous, I name San Miguel Island, California, where the typical form is abundant, as the type locality.

THAIS EMARGINATA, typical form.

Shell thick, solid, rotund, with a short spire of about three whorls without the nucleus, the body rude, with coarse nodulous or subspinose major spirals, a more or less flaring thickened outer lip, a very arcuate flattened pillar, short and hardly recurved canal, and sealed umbilical concavity (220975).

Measurements.

Whorls.	Height of shell.	Height of last whorl.	Height of aperture.	Breadth.
3	30	28	23	23
3	31	29	22	22
3½	32	28	21	20
3	34	30	23	23

THAIS EMARGINATA, var. OSTRINA Gould.

Tillamook, Oregon.

Shell thinner than the preceding, nearly smooth, the major spirals represented by interrupted bands of dark-brown color but not raised above the general surface, and generally with a more elevated spire (32176).

Measurements.

Whorls.	Height of shell.	Height of last whorl.	Height of aperture.	Breadth.
3½	27	24	19	16
3½	27	25	20	17
3½	36	31	26	23

THAIS EMARGINATA, new variety PROJECTA.

Sitka, Alaska.

Shell thinner, more elongate and with a pointed spire, the major and minor spirals more nearly equal, two strong spirals on the earlier whorls and the sutures more constricted. This is the more northern form (88842).

Measurements.

Whorls.	Height of shell.	Height of last whorl.	Height of aperture.	Breadth.
4	29	22	17.0	15.0
4½	32	24	18.5	17.0
5	31	24	19.0	16.5

THAIS (NUCELLA) FREYCINETII Deshayes.

Purpura freycinetii DESHAYES, Rev. Zool. Soc. Cuv., 1839, p. 360; Mag. de Zool. (Guerin), 1841, pl. 26.

Purpura freycincti MIDDENDORFF, Beitr. Mal. Ross., 1849, p. 117 (*part*); Sibir. Reise, vol. 2, pt. 1, 1851, p. 219, pl. 12, figs. 1–9.

Purpura freycinetii REEVE, Conch. Icon., vol. 3, *Purpura*, September, 1846, pl. 10, fig. 51.—SCHRENCK, Amurland Moll., 1867, p. 388.

Polytropa lapillus A. ADAMS, Ann. Mag. Nat. Hist., vol. 5, 1870, p. 423, not of Linnaeus.

Purpura freycinetii LISCHKE, Jap. Meeres Conch., vol. 2, 1871, p. 40, pl. 4, figs. 15–19.

Purpura lapillus DUNKER, Ind. Moll. Mar. Japan, 1882, p. 4, not of Linnaeus.—PILSBRY (following Adams), Cat. Mus. Moll. of Japan, 1895, p. 45.

Purpura freycinetii var. *alabaster* PILSBRY, Proc. Acad. Nat. Sci. Phila., for 1907, p. 246, pl. 20, fig. 2. Chishima, Japan.

Range.—Southern Kamchatka, the Kuril Islands, the south and west coasts of the Okhotsk Sea, Sakhalin Island and Northern Japan to Kushiro.

The shell described and figured by Deshayes is immature, the complete outer lip and labial callus are not yet formed. It is further exceptional in its feeble spiral sculpture and extremely low spire. However, the peculiarities of the pillar lip and the general form enable one to connect it with the common Japanese species with a reasonable degree of probability. Since the species goes through practically the same phases of variation as *T. lima*, and both are present over part of their range, more or less confusion has resulted in the literature either from a superficial examination or a paucity of material.

The variety *alabaster* has a certain analogy with the shorter heavy forms of *T. lamellosa*, other mutations recall *T. lima*, but the most common type of all among the specimens I have been able to bring together most resembles the rougher type of *T. emarginata*. If these all belong to one species, the process of divergent evolution is less complete in Japan than in America.

EXPLANATION OF PLATES.

PLATE 74.

FIG. 1. *Thais* (*Nucella*) *canaliculata* Duclos, variety *analoga* Forbes, unusually swollen and depressed form, from Lituya Bay, Alaska. Cat. No. 220974, U.S.N.M. Alt. 31 mm., p. 568.

2. *Thais* (*Nucella*) *canaliculata* Duclos, variety *compressa* Dall, from Monterey, California. Cat. No. 60102, U.S.N.M. Alt. 38 mm., p. 569.

3. *Thais* (*Nucella*) *canaliculata* Duclos, typical form (+*decemcostata* Middendorff) Unalashka, Alaska. Cat. No. 220973, U.S.N.M. Alt. 38 mm., p. 567.

4. *Thais* (*Nucella*) *canaliculata* Duclos, mutation with obsolete sculpture from Sitka, Alaska. Cat No 32197, U.S.N.M. Alt. 33 mm., p. 567.

5. *Thais* (*Nucella*) *lamellosa* Gmelin, variety *cymica* (smooth mutation) from Port Ludlow, Washington. Cat. No. 60125, U.S.N.M. Alt. 38 mm., p. 565.

6. *Thais* (*Nucella*) *lamellosa* Gmelin, variety *franciscana* Dall, from San Francisco Bay. Cat. No. 63909, U.S.N.M. Alt. 50 mm., p. 565.

7. *Thais* (*Nucella*) *lamellosa* Gmelin, typical form, from oyster reefs, Vancouver Island. Cat. No. 63873, U.S.N.M. Alt. 67 mm., p. 563.

8. *Thais* (*Nucella*) *lamellosa* Gmelin, variety *hormica* Dall, from inner harbor of Sitka, Alaska. Cat. No. 88862, U.S.N.M. Alt. 53 mm., p. 565.

PLATE 75.

FIG. 1. *Thais* (*Nucella*) *emarginata* Duclos, variety *ostrina* Gould, from Monterey, California. Cat. No. 32176, U.S.N.M. Alt. 36 mm., p. 570.

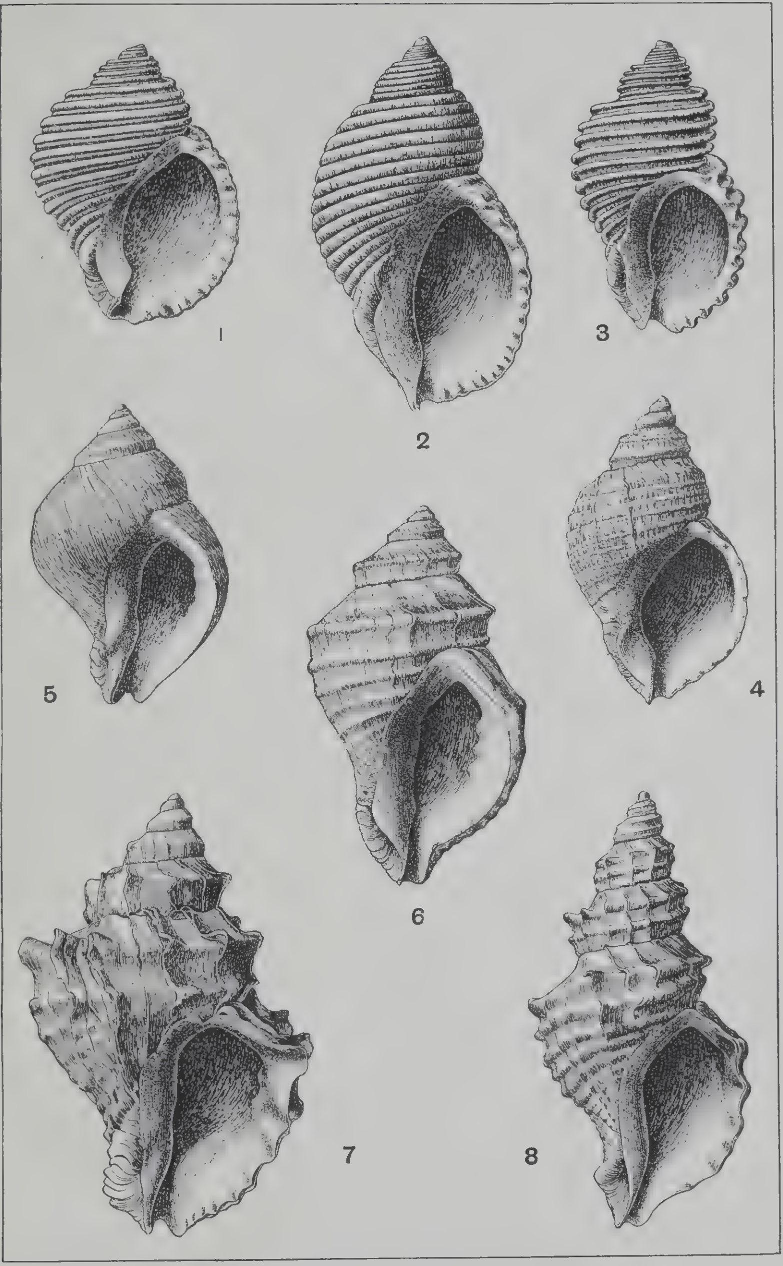
2. *Thais* (*Nucella*) *emarginata*, typical short and stout form, from Lituya Bay, Alaska. Cat. No. 220975, U.S.N.M. Alt. 30 mm., p. 569.

3. *Thais* (*Nucella*) *emarginata*, elevated form, from Monterey, California. Cat. No. 32179, U.S.N.M. Alt. 33 mm., p. 569.

4. *Thais* (*Nucella*) *lima* Martyn, typical form, smooth mutation, from Kadiak Island, Alaska. Cat. No. 60105, U.S.N.M. Alt. 33 mm., p. 566.

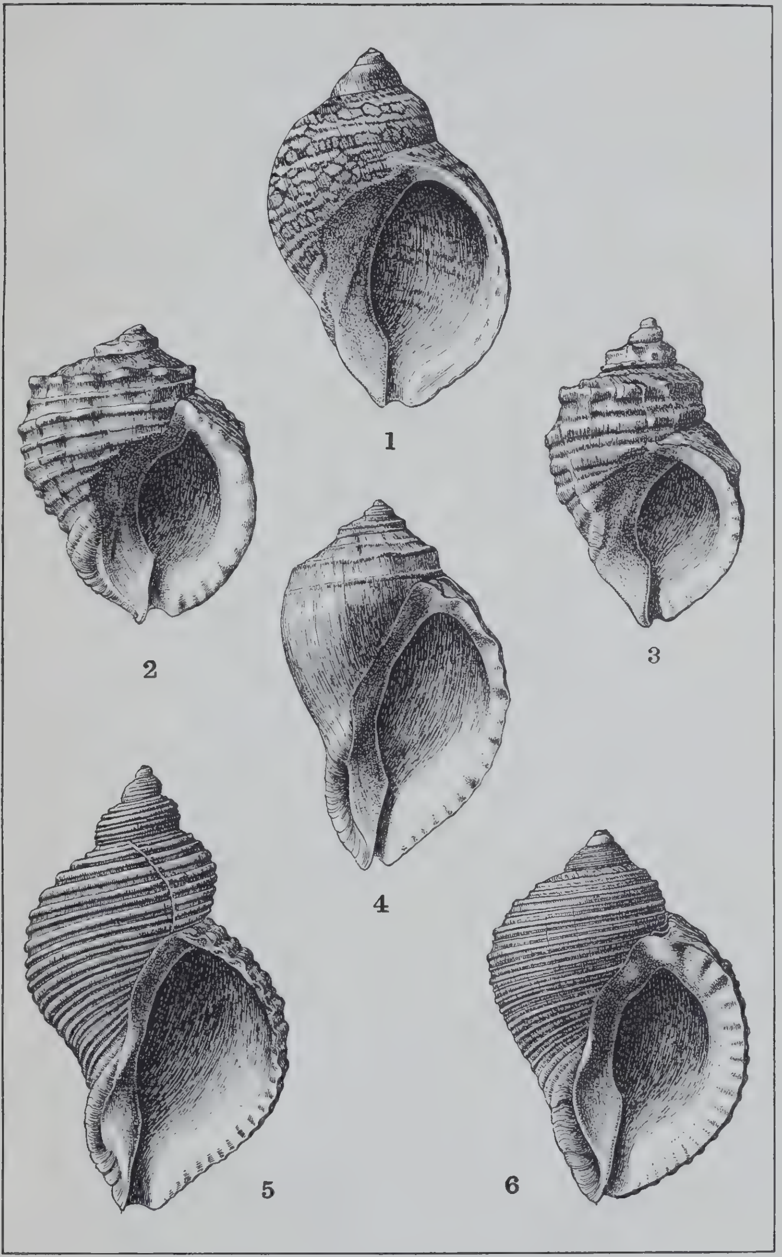
5. *Thais* (*Nucella*) *lima*, abnormally elevated mutation, from Unalaska, Alaska. Cat. No. 60084, U.S.N.M. Alt. 49 mm., p. 566.

6. *Thais* (*Nucella*) *lima*, normal form, heavy mutation, from Port Möller, Alaska. Cat. No. 220976, U.S.N.M. Alt. 40 mm., p. 566.



THAIS (NUCELLA) CANALICULATA AND THAIS (N.) LAMELLOSA.

FOR EXPLANATION OF PLATE SEE PAGE 572.



Thais (Nucella) emarginata and Thais (N.) lima.

For explanation of plate see page 572.

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A REVIEW OF SOME BIVALVE SHELLS OF THE GROUP ANATINACEA FROM THE WEST COAST OF AMERICA

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WILLIAM HEALEY DALL
Curator, Division of Mollusks, United States National Museum

No. 2116.—From the Proceedings of the United States National Museum,
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This group of bivalves contains species which are in general very similar, and often possess analogues in different faunal regions which have been confounded under a single specific name. Like most genera, when the specific characters are rigorously analyzed, the species separate into distinct groups arranged geographically in accordance with the general laws governing the distribution of mollusks.

Not a single Atlantic species of the temperate regions has so far been found on the Pacific coast of either American continent. Even the species which inhabit the western Arctic Ocean are mostly distinct from those of Greenland and Europe.

Family THRACIIDAE.

Taking up the Thracia family, we find that *Cyathodonta* is a very ancient group and species are found in the Antillean Oligocene. Typical *Thracia* seems to have come in in Eocene time. If, as claimed by Zittel, the Triassic *Corimya* of Agassiz is a *Thracia*, the group had its inception in the Mesozoic.

The earliest name for the latter is *Rupicola*, Fleuriau de Bellevue, 1802. This name, however, is preoccupied for a genus of birds, dating from 1760. Récluz[1] has described as existing between *Thracia* and *Rupicola* anatomical differences in the gills, foot, and siphon, which, if confirmed, would separate the two groups generically if not more widely. But I am unable from an examination of the literature of the subject to find satisfactory confirmation of these differences, which may have been due in the case of the Récluz specimen to mutilation or abnormality. *Ixartia* Leach, *Rupicilla* Schaufuss, and possibly *Pelopia* H. and A. Adams are synonymous with *Rupicola* Fleuriau. For the true *Thracia* Blainville, in the errata to his Manual (p. 600), restricts his group to that typified by *T. corbuloidea*, removing his division B, typified by *T. pubescens* to the genus *Osteodesma* Deshayes.

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[1] Journ. de Conchyl., vol. 4, p. 120, 1853.

The Pacific coast species have mostly been confused together, their supposed variability is largely due to confounding different species under one name. The nestling species, like *T. curta*, however, are naturally modified by their *situs*.

Genus THRACIA (Leach MS.) Blainville, 1824.

Type.—*T. corbuloidea* Deshayes.

(For full synonymy and discussion, see Trans. Wagner Free Inst. of Science, vol. 3, pt. 6, p. 1522, 1903.)

THRACIA CURTA Conrad.

Thracia curta CONRAD, Journ. Acad. Nat. Sci. Phila., vol. 7, p. 248, pl. 19, fig. 8, 1837. Type locality, Santa Barbara, California.

The shell, when normal, has much the shape of *T. corbuloidea* Deshayes, or *T. conradi* Couthouy, but never grows as large as the latter. It is frequently found nestling in rock cavities and borings, when young, and in such cases its general aspect conforms to the walls of the cavity, and so we have specimens simulating the profile of *Petricola*, *Lithophaga*, or a pholad. One such was that Conrad originally figured. The large series in the United States National Museum enables me to connect the various mutations with the normal form. This species is chalky white with a dehiscent brownish periostracum, and is densely coarsely granulose. A well grown specimen measures: Length, 53; height, 42; diameter, 22 mm.; with the vertical from the beaks falling 26 mm. in front of the posterior end. A larger fragment when complete must have measured over 60 mm. in length. I have not found a lithodesma, which perhaps is present in the young. The pallial sinus is linguiform and nearly reaches the vertical from the beaks. Cat. No. 74216*a*, U.S.N.M.

This species ranges from Icy Cape, Arctic Ocean, to Bering Strait, Plover Bay, the greater part of Bering Sea and the Aleutians, and southeast to San Diego, California. The more southern specimens do not attain the size of those from Alaska, judging by those which have been collected. The fossil *T. trapezoidea* Conrad is a more elongated shell.

THRACIA BERINGI, new species.

Thracia beringi (Dall) J. G. COOPER, Cat. shells in State Mining Bureau, 1894. (Name and distribution only. List not paginated.)

Shell of moderate size, white, with a dehiscent yellowish periostracum (usually lost), and looking much like a *Macoma sabulosa*. Valves nearly equal, nearly equilateral, with low beaks and a conspicuous external ligament enfolding the resilium. Surface with incremental irregularities and in the periostracum numerous small wrinkles, but without perceptible granulation. Pallial sinus large, rounded, not reaching the vertical from the beaks. Valves rounded at both ends, the posterior dorsal area inconspicuous, not bounded by a rib, and there is no indication of a lithodesma. Length, 35; height, 25; diameter, 12; vertical, from the posterior end, 16 mm. Maximum length 40, height 30 mm.

Distribution.—Arctic Ocean north of Bering Strait? Bering Sea and Aleutian Islands, south and east to Sitka, Alaska. (Type locality, Commander Islands.) Cat. No. 221555, U.S.N.M.

THRACIA CHALLISIANA, new species.

Shell large, chalky, subquadrate, almost equivalve, the posterior end longer, surface covered with a coarse, almost imbricating granulation, without radial elevations or defined dorsal areas. Both ends are rounded, there is no distinct posterior truncation, though that end is blunter than the anterior; resilium and ligament marginal, inconspicuous, with no indication of a lithodesma; pallial sinus wide, shallow, reaching only halfway from the posterior end to the vertical of the beaks. Length, 45; height, 33; diameter, 20; vertical from the beaks 25 mm. in front of the posterior end.

Distribution.—Type locality, San Juan Island, Gulf of Georgia. Cat. No. 272096, U.S.N.M. Also at Forrester Island, Alaska.

This species, which is allied to the fossil *T. condoni* Dall (1909), is named in honor of Miss Bertha M. Challis of the State Museum, Seattle, Washington, who has exhibited much interest in the mollusca of the region.

THRACIA DIEGENSIS, new species.

Shell very thin and small, whitish or brownish, usually with a deposit of rusty orange color about the margin; valves moderately subequally convex, the anterior end longer, the posterior end attenuated and squarely truncate; posterior dorsal area defined by a raised thread on each valve; surface smooth, except for incremental irregularities; beaks rather prominent; no perceptible granulations; hinge linear and very feeble, the resilifer not projecting; in the cavity of the beak a short line of brown matter resembling cement extends downward, which indicates the attachment of a widely V-shaped lithodesma which is usually lost; pallial sinus deep, reaching beyond the vertical of the beaks; base of valves nearly straight. Length, 9; height, 7; diameter, 4 mm.; vertical of the beaks 3 mm. in front of the posterior end.

Distribution.—Type locality, San Diego Bay, in 1 to 5 fathoms sandy mud, very abundant. Cat. No. 73604, U.S.N.M.

This little species resembles *T. fabula* Philippi, from Sicily. It is one of the few species which seem to flourish on the muddy bottom of the bay.

THRACIA COLPOICA, new species.

This is a species belonging to the same type as *T. diegensis* but larger, more rounded, with a more irregular surface; the posterior dorsal area is relatively narrower, bounded by a rib, beyond which is another more anterior rib, while in the left valve there is an obscure ray about the middle of the disk, but hardly visible in the opposite valve; at the posterior end the truncation is but obscurely indicated; the base is prominently arcuated. Length, 17; height, 13; diameter, 9 mm.; vertical of the beaks 7 mm. in front of the posterior end and barely reached by the pallial sinus.

Distribution.—Type locality, Gulf of California. Cat. No. 73639, U.S.N.M.

THRACIA SQUAMOSA Carpenter.

T. squamosa CARPENTER, Proc. Zool. Soc. London, for 1855, p. 229. Type locality, Mazatlan, Mexico.—REEVE, Con. Icon. *Thracia*, pl. 3, fig. 16, 1859.

This species has much the form of *T. phaseolina*, but the surface is densely granulose; ligament inclosing the resilium on the hinge margin; there is a vertical scar under the beaks, very large and more conspicuous than in most bivalves if, as seems probable, it denotes the attachment of the lithodesma. No lithodesma was noticed in the specimens.

Distribution.—Magdalena Bay, Lower California, to the Gulf of California. Cat. No. 15885, U.S.N.M.

Genus CYATHODONTA Conrad.

Cyathodonta CONRAD, Proc. Acad. Nat. Sci. Phila., vol. 4, p. 156, 1849. *Type.*—*C. undulata* Conrad.

CYATHODONTA UNDULATA Conrad.

C. undulata CONRAD, Proc. Acad. Nat. Sci. Phila., for 1849, vol. 4, p. 156.
C. granulosa GOULD, Boston Journ. Nat. Hist., vol. 6, p. 407, 1852, name only. Cited by Carpenter in Rep. British Assoc. Adv. Sci. for 1856, p. 231.
C. plicata CARPENTER and others, not of Deshayes.

This shell is large, elongate, with a very flat left valve and more convex right valve; the plaits are hardly oblique, and as usual are obsolescent on the part of the valve behind the anterior ray. They number 18 to 20. There are three faint rays on the left valve and two on the right. The surface is covered with minute granules definitely arranged in lines radiating from the umbones. The pallial sinus is rounded and high, reaching the vertical from the beaks, which are subcentral. Length, 48; height, 35; diameter of right valve, 10; left, 4 mm. The vertical from the beaks is 26 mm. in front of the posterior end of the valves.

Distribution.—La Paz and other localities in the Gulf of California. Cat. No. 73602, U.S.N.M.

This fine species is the largest of the West Coast species and the analogue of the *C. magnifica* Jonas, from the Atlantic coast of Honduras. Still larger single valves are in the collection.

CYATHODONTA DUBIOSA, new species.

Shell in general resembling *C. undulata* on a smaller scale. The left valve is nearly as convex as the right valve. The plaits are less regular, becoming obsolete behind and toward the basal margin. The left valve has only two very faint rays, the right valve also two, of which the dorsal one is strong. The granulation is in somewhat irregular concentric lines and not radially distributed; the pallial sinus is not so high relatively and falls short of reaching the vertical of the beaks. Length, 38; height, 29; diameter of right valve, 9; of left valve, 7.2; vertical, 15 mm. in front of the posterior end.

Distribution.—San Pedro to San Diego, California, and to La Paz, Lower California. Cat. No. 96450, U.S.N.M. Type locality, off La Paz.

The most obvious distinction between this and *C. undulata* of the same size lies in the greater relative convexity of the left valve in *C. dubiosa.*

CYATHODONTA LUCASANA, new species.

Shell small, whitish, translucent, fragile, elongate-quadrate, the anterior end longer; hinge marginal, feeble, a half-ring-shaped lithodesma in front of the resilifer; posterior end truncate, with a rounded ridge from the umbo to the basal end of the truncation; plications few and sparse; no granulation perceptible, and the sinus invisible on account of the translucency of the shell. Length, 7.5; height, 5; diameter, 3.75; vertical, 3 mm. in front of the posterior end.

Distribution.—Type locality, Cape St. Lucas, Lower California, Xantus. Cat. No. 15910*b*, U.S.N.M.

Not identical with the young of any of the other species.

CYATHODONTA PEDROANA, new species.

Shell small, white, resembling *C. dubiosa* but more pointed behind, hardly truncate, anterior end longer; valves nearly equally convex; the plaits are more numerous (±25), narrower, more close-set, and more regular, they reach the posterior dorsal margin; the rays are obscure; the granulations obscurely concentrically disposed; the sinus is small, shallow, and does not reach the vertical of the beaks. Length, 27; posterior end to vertical, 10; height, 21; diameter of right valve, 6; of left valve, 5 mm.

Distribution.—Type locality, in mud dredged from the channel of San Pedro Harbor, California. Also at Catalina Island. Cat. No. 207527, U.S.N.M.

This was quite abundant in the mud excavated by the Government dredgers, and is a particularly neat, compact, and pretty species.

CYATHODONTA GALAPAGANA, new species.

Shell small, elongate, white, the anterior end the longer; left valve rather convex, bearing a smooth narrow escutcheon, the remainder of the surface covered with very numerous (50–55) narrow, close-set, hardly oblique plaits; a single narrow ray borders the escutcheon; granulation not perceptible under an ordinary magnifier; the hinge linear, very weak; the truncation oblique, inconspicuous; the posterior end bluntly rounded below, the anterior end narrower, rounded; the umbo rather prominent; pallial sinus subquadrate, ascending, just reaching the vertical from the beak in the left valve. Length of left valve, 27; posterior end to vertical, 10; height, 18; diameter of left valve, 5 mm.

Distribution.—Type locality, near the Galapagos Islands at station 2813, in 40 fathoms, sand, dredged by Bureau of Fisheries steamer *Albatross*. Cat. No. 195029, U.S.N.M.

Only one left valve of this species was obtained.

The following unnamed Atlantic species may properly find a place here:

CYATHODONTA CRUZIANA, new species.

Shell small, thin, white, covered with a delicate straw-colored periostracum; valves unequal, moderately convex, the anterior end longer, the posterior end truncate, the whole covered with a coarse granulation irregularly, rather densely distributed; on the anterior dorsal slope of the right valve the plaits are obsolete, as they also are on the posterior dorsal area, which is not bordered by a distinct ray in front; between these areas the plaits (30–35) are continuous and fairly regular with subequal interspaces; on the anterior dorsal area of the left valve they reach practically to the margin; on this valve there are a median and a posterior obscure ray, the latter in front of the posterior dorsal area; hinge with a feeble ligament over a separate strong resilium, with a purse-shaped lithodesma in front of the resilifer; pallial sinus small, rounded, not reaching the vertical from the beaks. Length, 25; posterior end to the vertical, 10; height, 13; diameter of right valve, 6; of the left valve, 3.5 mm.

Distribution.—Type locality, near Santa Cruz Island, West Indies, in 38 fathoms at station 127; dredged by U. S. S. *Blake*. Cat. No. 64429, U.S.N.M.

This very neat little species is analogous to *C. pedroana* in the Pacific fauna.

The following forms allied to *Thracia* are known from the Pacific coast:

ASTHENOTHAERUS VILLOSIOR Carpenter, 1864.

Manuel Lagoon, Lower California, to Cape St. Lucas.

BUSHIA PANAMENSIS Dall, 1889.

Station 2805, in 51 fathoms, mud, Panama Bay, U. S. S. *Albatross*.

The following species of *Thracia* have been described from the Tertiary of the Pacific coast:

THRACIA TRAPEZOIDES Conrad, 1849.

Tertiary of Astoria, Oregon.

THRACIA MACTROPSIS Conrad, 1857.

Tertiary, Monterey County, California.

THRACIA DILLERI Dall, 1898.

Mid-Eocene, Arago beds, Oregon.

THRACIA SEMIPLANATA Whiteaves.

Eocene, Ventura County, California, according to Arnold.

THRACIA KARQUINEZENSIS Weaver, 1905.

Eocene, Contra Costa County, California.

THRACIA CONDONI Dall, 1909.

Miocene, near Eugene, Oregon.

THRACIA JACALITOSANA Arnold, 1909.

Miocene, Fresno County, California.

THRACIA VENTRICOSA Conrad,

Is a nude unidentifiable name, in Meek's Miocene Check-list, 1864.

There are species of *Cyathodonta* in the Oligocene marls of Panama, but these fossils have not yet been worked up.

Family PERIPLOMATIDAE.

Genus PERIPLOMA Schumacher.

Periploma SCHUMACHER, Essai d'un Nouv. Syst. Vers Test., pp. 40, 115, 1817. *Type.—P. inaequivalvis* Schumacher.

Osteodesma A, BLAINVILLE, Man., vol. 2, p. 659, 1827.

PERIPLOMA PLANIUSCULA Sowerby.

Periploma planiuscula SOWERBY, Proc. Zool. Soc. Lond. for 1834, p. 87. Isla de Muerte, Guayaquil.

Periploma lenticularis SOWERBY, Proc. Zool. Soc. Lond. for 1834, p. 87. Isla de Muerte, Guayaquil.

Periploma argentaria CONRAD, Journ. Acad. Nat. Sci. Phila., vol. 7, p. 238, pl. 18, fig. 8, 1837. California.

Periploma obtusa HANLEY, Ill. Lamarck's Shells, pl. 2, fig. 50, 1842. "West America."

Periploma alta C. B. ADAMS, Panama Shells, p. 292, 1852.

?*Periploma papyracea* CARPENTER, Proc. Zool. Soc. Lond. for 1855, p. 229. Mazatlan; not of Say, 1822.

Periploma excurva CARPENTER, Proc. Zool. Soc. Lond. for 1855, p. 229; Mazatlan.

Periploma excurvata CARPENTER, Rep. Brit. Assoc. 1856, p. 287. (Error for *excurva.*)

Distribution.—San Pedro, California, and south to Panama and Guayaquil. Cat. No. 153307, U.S.N.M.

Doctor Stearns in reviewing the West American species of the genus[1] expressed the opinion that several of the above-mentioned species are synonymous with that of Sowerby. A considerable series having accumulated in the national collection, the present writer is of the opinion that the variations exhibited, taken in connection with the fact that many years' collecting has not discovered any other species of this type in the region referred to, cover fairly well the figures of the several nominal species, and in default of typically named specimens authorize the presumption that the names cited in the synonymy represent only individual mutations of one species. Until further information to the contrary shall have been received it will be best so to consider them.

The familiar and appropriate name *argentaria*, given by Conrad, will therefore have to be retired in favor of the earlier *planiuscula* of Sowerby.

PERIPLOMA DISCUS Stearns, 1890.

Distribution.—Type locality, San Pedro Bay, California. Cat. No. 126931, U.S.N.M.

PERIPLOMA CARPENTERI Dall, 1895.

Distribution.—Type locality, Panama Bay, in 210 fathoms. Cat. No. 106891, U.S.N.M.

PERIPLOMA STEARNSII Dall, 1895.

Distribution.—Type locality, Gulf of California, in 24 fathoms. Cat. No. 110548, U.S.N.M.

PERIPLOMA (HALISTREPTA) SULCATA Dall, 1904.

Distribution.—Type locality, San Pedro Bay; Terminal Island and vicinity, California. Cat. No. 109318, U.S.N.M.

Family PANDORIDAE.

Genus PANDORA Hwass, 1795.

Subgenus KENNERLYIA Carpenter, 1864.

KENNERLYIA GRANDIS Dall, 1877.

Distribution.—This species ranges from the vicinity of the Pribilof Islands, Bering Sea, south and eastward to Siletz Bay, Oregon. Cat. No. 171069, U.S.N.M.

This is the largest species of the genus, though sometimes nearly approached by the allied *K. wardiana* A. Adams, of Japan. It is also found fossil in the Pleistocene of Santa Monica, California.

KENNERLYIA GLACIALIS Leach, 1819.

Distribution.—Arctic Sea at Point Belcher, and south to Fuca Strait. Cat. No. 73514, U.S.N.M.

This is also reported from Spitsbergen and was originally described from Greenland seas.

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[1] Proc. U. S. Nat. Mus., vol. 13, No. 813, pp. 222–224, 1890.

A variety *eutaenia* of this species with a more rostrate posterior end and averaging larger than the typical form was obtained at Port Etches and eastward at Sitka, in Alaska. Cat. No. 171062, U.S.N.M.

KENNERLYIA FILOSA Carpenter, 1864.

Distribution.—From the vicinity of Nunivak Island, Bering Sea, south and eastward to San Pedro, California. Cat. No. 4542, U.S.N.M.

KENNERLYIA BILIRATA Conrad, 1855.

+ *K. bicarinata* Conrad, 1864.

Distribution.—Forrester Island, Alaska, southward to Point Abreojos, Lower California. Cat. No. 1063, U.S.N.M.

KENNERLYIA GRANULATA, new species.

Shell closely resembling in form the *bilirata*, but much smaller, more translucent, and of a greenish tint, with the base and dorsal margins more nearly parallel and with the elevated lirae of the posterior dorsal surface delicately granulated.

Length, 8.5; height, 4; diameter, 1; beaks behind the anterior end, 1 mm.

Distribution.—Santa Barbara, California, to Guaymas, Mexico, and especially abundant at the type locality on muddy bottom in the vicinity of La Paz, Lower California. Cat. No. 211348, U.S.N.M.

This minute species is extremely common in shallow water with a muddy bottom near the end of the Lower California peninsula. It shows on the flat valve hardly any trace of the brown radiating irregular lines so common in species of this group.

KENNERLYIA CONVEXA, new species.

Shell short, deep, with a very convex left valve and a nearly semicircular outline; right valve flattish, concave near the basal margin, white, with a conspicuous velvety brownish periostracum, especially on the rostrate end; a few irregularly radiating lines on the disk; dorsal margins nearly straight, base evenly rounded, left valve slightly rostrate behind; exterior of the left valve with a few obscure slightly elevated radial lines on the disk and two posterior dorsal radial lirations. Hinge very feeble, resilium short, with a thick lithodesma; teeth in the right valve closely adjacent, small. Length, 21; height, 12; diameter, 3.5; beaks behind anterior end, 5.5 mm.

Distribution.—Type locality, Ballenas Lagoon, Lower California, in 48 fathoms. Cat. No. 171068, U.S.N.M.

This is a well-marked form, with the anterior area of the left valve not set off by an impressed line, but marked by a distinct inset at the basal margin.

KENNERLYIA PATAGONICA, new species.

Shell bearing a marked resemblance to the *K. bilirata* of the California coast; white with a dehiscent grayish periostracum; hinge line nearly straight, the posterior left dorsal margin sharply reflected outward, with two sharp radial lines below it; the surface of the disk anteriorly has a few obscure hardly elevated radial lines, with the anterior area feebly marked and only slightly interrupting the basal margin, which is evenly rounded; posterior end truncate above but hardly rostrate; right valve flat above, concave near the basal margin, with a few irregular radial impressed lines, and two grooves above, corresponding to the lirae of the opposite valve; basal curve meeting the anterior dorsal margin in a sharp angle; hinge very feeble, teeth very short, and adductor scars very small. Length, 14.5; height, 8; diameter, 2; beaks behind anterior end, 3.5 mm.

Distribution.—Type locality, west coast of Patagonia in 61 fathoms, mud; bottom temperature, 54° F. Cat. No. 96937, U.S.N.M.

This little species is surprisingly like the northern one. The only other one of the group yet found in the Patagonian region is a *Pandora.*

Subgenus CLIDIOPHORA Carpenter, 1864.

CLIDIOPHORA CLAVICULATA Carpenter, 1855.

Distribution.—From Scammon Lagoon, Lower California, to Panama. Cat. No. 15931, U.S.N.M.

Subgenus HETEROCLIDUS Dall, 1903.

HETEROCLIDUS PUNCTATUS Dall.

Clidiophora punctata (Conrad, 1837) CARPENTER, 1855.

Distribution.—Clayoquot, Vancouver Island, British Columbia, and south to the Gulf of California. Cat. No. 15794, U.S.N.M.

This species lacks the long posterior left lamina which is one of the characteristics of the typical *Clidiophora.*

Subgenus COELODON Carpenter, 1864.

COELODON RADIANS, new species.

Shell small, delicate, white, arcuate behind the beaks, compressed, with the anterior area defined by an impressed line but not interrupting the basal margin; posterior dorsal margin flat, with one sharp radial lira below its outer edge; anterior dorsal margin straight, short; surface of the valves smooth except for incremental lines, with a pale straw colored periostracum; basal margin evenly arcuate; right valve with three short diverging teeth, the central one shortest; left valve with two rather short diverging laminae with a short deck covering the angle at their junction, the resilium attached to the anterior face of the posterior tooth and carrying a thin lithodesma.

Length, 15; height, 8; diameter, 1.3; beaks behind the anterior end, 3.5 mm.

Distribution.—Type locality, near Ballenas Lagoon, Lower California, in 5½ fathoms.

Cat. No. 171053, U.S.N.M.

Carpenter thought this group, which he regarded as a genus, was confined to oriental seas, but the discovery of this species adds it to the West American fauna. It may be that the supposed specimen of *C. ceylanica*, obtained by Cuming at Muerte Island, West Colombia, and referred to by Sowerby and Carpenter, belongs to the present species, which has the disk within the pallial line marked by radiating lines.

Subgenus FOVEADENS Dall, 1915.

Hinge with two diverging teeth in the right valve the posterior longer and higher; an obscure ridge reaching to the front edge of the anterior adductor scar may represent a third tooth; in the left valve are two short teeth close together, a long lamina in front of them carries the resilium on its posterior face; the top of this lamina is grooved and from its anterior edge a deck or sheet of shelly matter unites it with the margin of the valve leaving a hollow space beneath the deck and between the lamina and the margin.

Type.—Foveadens panamensis Dall.

FOVEADENS PANAMENSIS, new species.

Shell thin, white, compressed, anterior dorsal margin flattened, in the right valve a marked groove below its outer edge; the disk slightly concentrically undulate, sculptured with faint incremental lines, anterior area hardly defined; anterior dorsal margin slightly convex, posterior slightly concavely arcuate; left valve with a single liration below the edge of the dorsal margin and close to it; hinge as in the subgeneric diagnosis. Length, 18; height, 11; diameter, 1; beaks behind the anterior end, 4 mm.

Distribution.—Type locality, beach at Old Panama, Doctor MacDonald. Cat. No. 252276, U.S.N.M.

Only loose valves were found of this interesting form.

Subgenus PANDORA sensu stricto.

PANDORA CISTULA Gould, 1850.

Distribution.—Patagonia, U. S. Exploring Expedition. Cat. No. 5887, U.S.N.M.

While this species was obtained, according to the original label, somewhere in the eastern part of the Patagonian archipelago, it probably extends its range also to the western part, and so the reference to it here is not out of place.

Family LYONSIIDAE.

Genus LYONSIA Turton, 1822.

Pandorina SCACCHI, Osserv. Zool., p. 14, 1833; not of Bory St. Vincent, 1824, (*Polygastrica.*)

Magdala (Leach MS.) BROWN, Illus. Conch. Grt. Britain, 1827, expl. pl. 11, figs. 1, 2, 10.

Hiatella BROWN, 1827, not Daudin, 1802.

Myatella BROWN, Illus. Conch. Grt. Britain, 2nd ed., p. 111, 1844.

Osteodesma DESHAYES, Encycl. Méth., vol. 3, p. 552, 1830, in table. *Type*—*Mya norvegica* Gmelin.

LYONSIA STRIATA Montagu.

Mya striata MONTAGU, Trans. Linn. Soc., vol. 11, p. 188, pl. 13, figs. 1, A, 1815—TURTON, Conch. Dict., p. 105, fig. 99, 1819.

Lyonsia striata TURTON, Dithyra Brit., p. 35, pl. 3, figs. 6, 7, 1822. (*Syn. ex parte exclus.*)

?*Lyonsia bracteata* GOULD (as *Osteodesma*), Expedition shells, Proc. Boston Soc. N. Hist., vol. 3, p. 218, May, 1850; U. S. Expl. Expedition (Wilkes), p. 397, pl. 35, figs. 509, *a*, *b*, 1852.

Distribution.—Shetland Islands; Arctic Sea; on the Pacific from the Aleutian Islands south to the coast of Washington. Cat. No. 213722, U.S.N.M.

On the northern coast of Europe and the British Isles occur two forms of *Lyonsia*, one of which recurs on the Pacific coast of America. One of these is the *Mya norvegica* of Gmelin,[1] after Chemnitz,[2] and is the well known *Lyonsia norvegica* of northern Europe. The other, which was first named by Montagu *Mya striata*, differs by being a thinner, smaller, and more slender shell, with the posterior dorsal margin nearly straight and more sharply truncate, while in *norvegica* it is concavely arcuate; the test is almost translucent, the form less inflated, the dorsal, and in many cases the basal edges near the margin, conspicuously compressed, the umbones nearer the anterior end; and the surface with usually a much greater profusion of adherent sand grains than in the *L. norvegica*. The differences are fairly well indicated by Turton's figures in his Conchological Dictionary (figs. 99 and 100, 1819), and, though there is more or less variation, yet no one comparing adult and well preserved specimens can well avoid noting the distinctions.

The two have been generally regarded as mere mutations of the *norvegica* type, but the presence of one and not of the other on the Pacific coast would indicate a specific distinction. The fragments remaining of Gould's type of *bracteata* indicate that it belongs with the *striata* form, though his figure is not characteristic. Middendorff's synonymy includes practically all the northern species of *Lyonsia* under one name, but his figures relate only to the following form.

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[1] Syst. Nat., vol. 7, p. 3222, 1792.

[2] Conchyl. Cabinet, vol. 10, pl. 170, figs. 1647–8, 1788.

LYONSIA ARENOSA Möller.

Pandorina arenosa MÖLLER, Index Moll. Grönl., p. 20, 1842; Beechey's Voy. to the Pacific, pl. 43, fig. 3, 1839 (not named in the text).
Lyonsia gibbosa HANCOCK, Ann. Mag. Nat. Hist., vol. 18, 1846, p. 238, pl. 5, figs. 11, 12.
Anatina striata GRAY (not Montagu), according to Hancock, Ann. Mag. Nat. Hist., vol. 18, 1846, p. 238 (not in Appendix to Ross's Voyage).
Lyonsia flabellata GOULD, Otia Conch., p. 162, 1861.
?*Lyonsia ventricosa* GOULD, Otia Conch., p. 161, 1861. N. Japan.
Osteodesma aeruginosa MIGHELS (ubi ?).
Lyonsia arenosa var. *sibirica* LECHE, *Vega* Exp., vol. 3, p. 439, pl. 22, figs. 3, 4, 1882.

Distribution.—Greenland and Arctic Sea. On the Pacific from the Arctic south to Japan and the Okhotsk Sea on the west, and to the Aleutian chain and Kadiak Island on the east. Cat. No. 223476, U.S.N.M.

This yellowish, short and solid species is well distinguished from any of the others. Leche's variety is more elongate than the normal type. A full series of the form from north Japan would doubtless make clear the identity of Gould's *ventricosa* with the Arctic species.

LYONSIA GOULDII, new name.

Osteodesma nitidum GOULD, Mex. and Cal. Shells, p. 17, pl. 15, fig. 6, May, 1851. Not *Mya* (=*Lyonsia*) *nitida* Fabricius, 1798.—*Osteodesma nitidum* GOULD, Otia Conch., p. 187, 1861. Type locality, Santa Barbara, California.

Distribution.—San Francisco Bay, California, and south to Point Abreojos, Lower California. Cat. No. 131739, U.S.N.M.

This small, slender, and very pearly species is different both in form and distribution from the preceding.

LYONSIA CALIFORNICA Conrad.

Lyonsia californica CONRAD, Journ. Acad. Nat. Sci. Phila., vol. 7, p. 248, pl. 19, fig. 20, 1837.

Distribution.—Puget Sound, Washington, and south to Todos Santos Bay and the Coronado Islands, Lower California. Cat. No. 253111, U.S.N.M.

This white and pearly species takes much the same place in the fauna that *L. coruscans* Scacchi does in the South European fauna. It is the most common species on the Californian coast and is usually more or less arcuate and very pearly. A variety with nearly cylindrical form without arcuation from San Francisco Bay has been named by me *L.* var. *haroldi* in honor of Mr. Harold Hannibal, of Stanford University, and a very thin, smaller, and translucent form from Catalina (type locality) and the Coronado Islands, with the beaks very close to the anterior end, may be called var. *nesiotes*. The latter may possibly, with more material, prove distinct. Cat. No. 206410, U.S.N.M.

LYONSIA PUGETENSIS Dall.

Lyonsia pugetensis Dall, Proc. U. S. Nat. Mus., vol. 45, No. 2002, p. 595, June, 1913.

Distribution.—Chignik Bay, Alaska Peninsula, and east and south to Puget Sound, Washington. Cat. No. 249966, U.S.N.M. Type locality near Queets River, Washington.

This is probably the largest described species of the genus. An immature specimen was used as a type for the description, because it was perfect and not eroded. It showed nothing which could be considered as a lunule or escutcheon. Adult specimens measure 52 mm. long by 28 mm. high and 16 mm. in diameter.

LYONSIA PANAMENSIS Dall.

Lyonsia panamensis Dall, Bull. Mus. Comp. Zool., vol. 43, No. 6, Oct. 1908, p. 427, pl. 18, fig. 12.

Distribution.—Type locality, Gulf of Panama, 556 fathoms. Cat. No. 110584, U.S.N.M.

This is closely allied to *L. arenosa* and to the following species.

LYONSIA FRETALIS, new species.

Shell small, thin, white, hardly pearly, subdonaciform, covered with a rather strong, smooth, brownish periostracum ornamented with sparse, distant, elevated, radial lines, about a dozen in number; beaks prominent, opisthogyrate, close to the anterior end; anterior end broadly rounded, posterior end narrower, rounded bluntly, not truncate; no lunule or escutcheon; periostracum extending slightly beyond the calcified margins; interior slightly pearly, pallial line with (for the genus) a rather well-marked sinus; hinge feeble, the resilium parallel with the margin, the lithodesma elongate-quadrate. Length, 10; height, 7; diameter right valve, 4, left valve, 3 mm.; beaks behind the anterior end, 2.5 mm.

Distribution.—Type locality, Straits of Magellan, in 20 fathoms. Cat. No. 96196, U.S.N.M.

This species has close relations with the Arctic *L. arenosa.*

I have not seen the *Anatina cuneata* of Gray, 1824, which has generally been referred by authors to *Entodesma*, but Hanley's copy of the original figure in his edition of the Index Testaceologicus, resembles a typical *Lyonsia* rather than an *Entodesma*. *E. chilense* Philippi which has been united with it is certainly a very different shell, as is *Entodesma pictum* Sowerby, although both were referred, in my Report on Peruvian Shells (1909), on the authority of other authors to *cuneata* Gray. The *Lyonsia patagonica* of Orbigny in the Voyage dans l'Amérique Méridionale, is from the Atlantic coast, at the Bay of San Blas, and is probably an *Entodesma;* his *L. alvarezii* from the same locality a true *Lyonsia*, but unlike either of the Pacific species. It is probable that *L. brevifrons* of Sowerby, 1834, from Ecuador, is identical with *L. cuneata* Gray. *L. malvinensis* Orbigny, is probably not a *Lyonsia* but a member of the Leptonacea.

Subgenus **ALLOGRAMMA** Dall.

Allogramma DALL, Trans. Wagner Inst., vol. 3, pt. 6, p. 1514, 1903. *Type.*—*Lyonsia formosa* Jeffreys.

ALLOGRAMMA AMABILIS Dall.

Lyonsia (*Allogramma*) *amabilis* DALL, Proc. U. S. Nat. Mus., vol. 5, No. 2002, p. 594, 1913.

Distribution.—Type locality, off Santa Barbara Channel, California, in 534 fathoms. Cat. No. 267171, U.S.N.M.

Subgenus **ENTODESMA** Philippi.

Entodesma PHILIPPI, Arch. f. Naturg., 1845, vol. 1, p. 52; 1847, p. 66. *Type.*—*E. chilense* Philippi.

Philippina DALL, Moll. Porto Rico, Bull. U. S. Fish Com. for 1900, p. 498, 1901. *Type.*—*Lyonsia beana* Orbigny.

ENTODESMA CHILENSE Philippi, 1845.

Distribution.—Type locality, Chiloë Island and north to Valparaiso, Chile. Cat. No. 73609, U.S.N.M.

This is very close to *Lyonsia inflata* Conrad, the only difference I can see is that in normally developed specimens the posterior part of the shell is more patulous, flatter, and less distinctly truncate in the Chilean shell. However, a large series of both might lead to a different conclusion. As these mollusks are nestlers, the valves are usually much distorted, taking the form of their situs. *E. navicula* Adams and Reeve, of Japan, is a very similar shell.

ENTODESMA INFLATUM Conrad.

Lyonsia inflata CONRAD, Journ. Acad. Nat. Sci. Phila., vol. 7, p. 248, pl. 19, fig. 10, 1837. Guayaquil.

Lyonsia diaphana CARPENTER, Proc. Zool. Soc. London, for 1855, p. 228. Mazatlan (young shell).

Entodesma spongiophila DALL (MS.), 1866, Monterey, Cailfornia.

Distribution.—Vancouver Island to Salina Cruz, Mexico, and Guayaquil. Cat. No. 15522*b*, U.S.N.M.

These shells are usually found living in sponges or the mass of compound ascidians, and they differ from the rock nestlers in their polished smooth surface and normal shape.

ENTODESMA PICTUM Sowerby.

Lyonsia picta SOWERBY, Proc. Zool. Soc. London, 1834, p. 88. Type locality, Muerte Island, Ecuador.

This species is much the shape of *E. beana* Orbigny of the West Indies, but differs by its painting of radial black lines on the corneous ground of the periostracum.

Section AGRIODESMA Dall.

Agriodesma Dall, Proc. U. S. Nat. Mus., vol. 37, No. 1704, p. 284, Nov. 1909. *Type.—Entodesma saxicola* Baird.

ENTODESMA (AGRIODESMA) SAXICOLA Baird.

Lyonsia saxicola Baird, Proc. Zool. Soc. London, for 1863, p. 70. Type locality, Vancouver Island.

Distribution.—Nestling like *Saxicava* in rock crevices from Unalaska, Aleutian Islands, eastward and southward to San Pedro, California. Cat. No. 88876, U.S.N.M.

This enormous rude species, sometimes reaching nearly 6 inches in length, is by all odds the largest species of the family. The coarse horny periostracum in drying always cracks the calcareous portion of the valves and I have never seen a perfect specimen except when preserved in alcohol. Its nestling habit results in an infinite variety of distorsion. The lithodesma is very large and strong and is inserted obliquely below the dorsal margin. The varietal name *cylindracea* Carpenter was given to specimens which had grown to fit borings of *Lithophaga.*

ENTODESMA (AGRIODESMA) SCAMMONI Dall.

Entodesma scammoni Dall, Amer. Journ. Conch., vol. 7, pt. 2, p. 142, pl. 16, fig. 3, 1871.

Distribution.—Type locality, Port Simpson, British Columbia (Scammon). Cat. No. 213713, U.S.N.M.

This species differs from all the others in its brilliantly pearly interior, its oval shape, and its permanently adherent periostracum without radiating lines. Only the original specimens collected in 1865 have so far been obtained.

Genus MYTILIMERIA Conrad.

Mytilimeria Conrad, Journ. Acad. Nat. Sci. Phila., vol. 7, p. 246, pl. 19, fig. 5, 1837. *Type.—M. nuttallii* Conrad.

MYTILIMERIA NUTTALLII Conrad.

Distribution.—Vancouver Island and south to San Diego, California. Cat. No. 74234, U.S.N.M.

It is by no means certain that this genus is properly placed here, despite its conchological characters. The little that is known of its anatomy points rather in the direction of *Verticordia.* The animal lives surrounded by a mass of spongy texture which has been referred to as "sponge," but it is possible that the substance is a consolidated mucous exudation secreted by the animal itself. Further researches are needed to settle these questions.

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no. 31

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SUMMARY OF THE MOLLUSKS OF THE FAMILY ALECTRIONIDAE OF THE WEST COAST OF AMERICA

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BY

WILLIAM HEALEY DALL
Honorary Curator of Mollusks, United States National Museum

No. 2166.—From the Proceedings of the United States National Museum,
Vol. 51, pages 575–579

Published January 15, 1917

FOR THE INCREASE AND DIFFUSION OF KNOWLEDGE AMONG MEN · PER ORBEM · SMITHSONIAN INSTITUTION · WASHINGTON · 1846

Washington
Government Printing Office
1917

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SUMMARY OF THE MOLLUSKS OF THE FAMILY ALECTRIONIDAE OF THE WEST COAST OF AMERICA.

By William Healey Dall,
Honorary Curator of Mollusks, United States National Museum.

In reviewing the West American Nassas in the United States National Museum the following notes were made which may be useful to students of the West Coast fauna.

It has long since been pointed out that the name *Nassa*, applied first by Bolten in 1798 to the shell later named by the brothers Adams *Iopas* (*sertum* Lamarck), could not be used for the different group to which Lamarck gave the name a year later.

Bolten included the Lamarckian Nassas, typified by *Buccinum arcularia* Gmelin, in the second section of his genus *Distorsio*. If we regard only the aspect of the shells this arrangement was not unjustified by the current ideas of the time.

The different groups of the Lamarckian Nassas grade into one another so insensibly that it is difficult to award generic rank to any portion of the genus. However, a practical solution of the difficulty from a conchological standpoint, pending anatomical researches, is to use Link's name *Arcularia* (1807) for the group carrying a heavy callus about the aperture and a hump on the back of the last whorl, typified by *Buccinum arcularia* Gmelin; and for the reticulate species with little or no callus, no hump, and simple or nearly simple outer lip, Montfort's name *Alectrion* (1810), typified by *Buccinum papillosum* Linnaeus. The numerous sections into which these groups have been divided, may for the present purpose be ignored. The name which is masculine may be supposed to have been suggested by a distant resemblance of the sculpture to the caruncles of a cock's comb.

Alectrion fossatus Gould, 1850. This is *Buccinum elegans* of Reeve, 1842, but not of J. Sowerby, 1814. Its known range is from Vancouver Island south to the vicinity of Cerros Island, Lower California, and possibly to the Gulf.

Alectrion grammatus Dall, new species. Pleistocene of Santa Barbara, California. About the same size as *fossatus*, but more regular and compact, with a uniform sculpture of flat spiral cords separated by narrow channels without intercalary minor spirals. (Cat. No. 101721, U.S.N.M.) There are several older fossils of this family not included in this list.

Alectrion (Schizopyga) californianus Conrad, 1856. This is *fossata* part Gabb, not of Gould. It has been collected from Drakes Bay, north of San Francisco to the San Ignacio lagoon, Lower California.

Alectrion perpinguis Hinds, 1844. This is probably the same as *Nassa interstriata* Conrad, 1856, from the Santa Barbara Pleistocene, and has even been reported from the Miocene. Its known range is from Puget Sound to Cerros Island.

Alectrion dentiferus Powys, 1835. Peru and Chile.

Alectrion rubricatus Gould, 1849. Peru and Chile.

Alectrion gayii Kiener, 1834. This is probably *exilis* Powys, 1835, and *obscurus* Hupé 1854. Peru and Chile.

Alectrion planicostatus A. Adams, 1851. Payta, Peru.

Alectrion mendicus Gould, 1850. *Nassa woodwardi* Forbes, 1850, and *gibbsi* W. Cooper, 1857, are synonymous.

The species ranges from Kodiak Island, Alaska, to San Diego, California. It is reported from the Pliocene and Pleistocene.

Alectrion cooperi Forbes, 1850. Puget Sound and south to San Diego; also Pliocene and Pleistocene. I am inclined to think it distinct from *mendicus*, though the latter sometimes has a few strong ribs.

Alectrion cerritensis Arnold, 1903. Originally described from the Pleistocene of Los Cerritos, California. We also have it living from San Pedro to the Gulf of California. The living specimens are not quite as large as some of the fossils, and resemble young specimens of *fossatus*, but are narrower.

Alectrion pagoda Reeve, 1844. This is *Buccinum decussatum* Kiener, 1834, but not of Linnaeus, 1758. *Nassa acuta* Carpenter, 1857, and *corpulenta* C. B. Adams, 1852, are synonymous. It is known to range from the Gulf of California to Panama.

Alectrion miser Dall, 1908. A rather deep water species, like a coarse, stumpy *perpinguis*, dredged from Acapulco to Panama, and usually eroded.

Alectrion exsarcus Dall, 1908. In deep water off the Galapagos Islands.

Alectrion goniopleura Dall, 1908. With the last.

Alectrion townsendi Dall, 1908. With the two preceding species.

Alectrion tschudii Troschel, 1852. From Cerros Island, Lower California, to Peru.

Alectrion moestus Hinds, 1844. This was named *brunneostoma* by Stearns in 1893, and ranges from the Gulf of California to Chile.

Alectrion versicolor C. B. Adams, 1852. It ranges from Magdalena Bay, Lower California, to Payta, Peru.

Alectrion nodicinctus A. Adams, 1851. This species ranges from San Diego, California, to Panama and the Galapagos.

Alectrion escalae Philippi, 1860. This extremely pretty little species has been collected at Antofagasta and Mejillones, Chile.

Alectrion catallus Dall, 1908. Dredged from off San Miguel Island, California, to the Gulf of Panama.

Alectrion insculptus Carpenter, 1863, not of Cooper, 1888. This elegant species has been collected from Point Arena, California, to Cerros Island, and also from the Pleistocene.

Alectrion insculptus, new variety *eupleura* Dall. In this form the axial ribs, which in the type are only indicated at the suture, are prolonged over the periphery of the whorl to the base. It has been collected from San Simeon, California, to Cerros Island. (Cat. No. 209046, U.S.N.M.)

Alectrion taeniolatus Philippi, 1845. Collected from Acapulco, Mexico, to Guayaquil and Chile. A small reticulate species, white with two or three brown spirals, one at the suture.

Alectrion limacina Dall, new species. Shell very small, glistening, yellowish white with flecks of brown, especially one on the anterior angle of the outer lip; nuclear whorls smooth, three, followed by three and a half sculptured whorls; axial sculpture of 8 or 10 ribs coronated at the suture and the shoulder, crossed by two sharp narrow sulci between the sutures and by about six on the last whorl with three stronger on the base; the ribs are obsolete anteriorly on the last whorl; outer lip white, strongly varicose, with six or seven internal lirae. Length, 5.3; diameter, 3 mm. Gulf of California in shallow water. (Cat. No. 274095, U.S.N.M.)

Alectrion onchodes Dall, new species. A small, short, acute, swollen, evenly reticulate, whitish shell with a channeled suture, three smooth nuclear and three reticulate whorls, a heavily thickened outer lip with seven or eight denticles inside; a smooth labium, subsutural nodule, and short canal. Length, 6 mm.; width, 5; spire, 2.5 mm. (Cat. No. 96827, U.S.N.M.) Collected from off Cerros Island, Lower California, to Panama.

Alectrion polistes Dall, new species. Shell rather large, acute, with nine rounded whorls of which about three are nuclear and smooth, the rest reticulate; the axial sculpture stronger, of (on the last whorl about 23) arcuate, similar, narrow ribs with wider interspaces, crossed between the sutures by six or seven flattish spirals with narrower channeled interspaces in which as a rule there are no intercalary threads. The siphonal fasciole is in front of a deep sulcus, the labial callus is thin and obscurely lirate; the outer lip varicose and internally lirate, the canal very short. The color is yellowish white. Length, 24; width, 15; length of aperture, 12 mm. (Cat. No. 96642, U.S.N.M.) This species has been dredged from Panama Bay to Sechura Bay, Peru, in moderate depths of water.

Arcularia luteostoma Broderip and Sowerby, 1829. *A. xanthostoma* Gray, 1839, is synonymous. This very distinct species ranges from the Gulf of California to Chile.

Arcularia tiarula Kiener, 1834. Cape St. Lucas to Panama. This is the whitish, polished, smooth-backed form with coronated last whorl and brown spots in front of the suture, which with the two following forms has generally been regarded, following Carpenter, as a variety of *tegula*. It is certain they are intimately allied but are geographically of different distribution. This is the southern form ranging from Cape St. Lucas to Panama.

Arcularia nodulifera Philippi in Carpenter, 1857. This form is strongly spirally sulcate and ranges from San Diego, California, to the Gulf of California. It is usually dark gray with a rude surface.

Arcularia tegula Reeve, 1853. This is the large, dark-colored form which ranges from San Francisco to San Diego, California.

Arcularia crebristriata Carpenter, 1857. This form ranges from Mazatlan to Salina Cruz, Mexico.

Arcularia complanata Powys, 1835. This is the dark form of which the two following may be geographical races. It ranges from Panama to Valparaiso.

Arcularia major Stearns, 1894. Larger, yellow brown, apparently quite distinct from the preceding. Ranges from Panama to the Gulf of California.

Arcularia iodes Dall, new species? Pale violet with darker violet spiral bands and conspicuous white callus about the mouth. Smaller than *major* or *complanata*. (Cat. No. 53946, U.S.N.M.) Gulf of California.

Arcularia scabriuscula Powys, 1835. *Nassa stimpsoniana* C. B. Adams, 1852, is synonymous. Ranges from Montijo Bay, Central America, to Panama.

Arcularia exilis Powys, 1835. This is *Nassa fontainei* Orbigny, 1841, and *panamensis* Philippi, 1851, not of C. B. Adams, 1852. It ranges from Panama to Peru and Chile.

Ilyanassa obsoleta Say, 1822. This species has been introduced with "seed" oysters from the Atlantic coast, and at last accounts was flourishing on the oyster beds in San Francisco Bay.

The only recorded recent species from this region of which I have not seen specimens and which are not contained in the collection of the United States National Museum are *Arcularia paposana* Philippi, 1860, from Paposo, Chile; *festiva* Powys, 1835, Panama to Guayaquil; and *sparta* Marrat, 1897, from the "west coast of South America."

The following forms near to or usually associated with the Nassas, may not improperly be included here:

Genus PHOS Montfort, 1810.

Phos cocosensis Dall, 1896. Gulf of Panama, Cocos Island. (Gulf of California?)

Phos crassus Hinds, 1844. Lower California and the Gulf of California.

Phos chelonia Dall, new species. Shell very similar in general appearance and size to *P. varicosus* Gould, having similar whitish varices, about three or four to a whorl, but differing by having the whorls appressed to the suture, not deeply impressed, and in having a nuclear shell of five or six whorls, deeply spirally sulcate instead of a nearly smooth one of three and a half whorls. The color of the present species is pale yellowish with a tinge of brown, as in *varicosus*, which also has narrower and more numerous ribs between the varices. (Cat. No. 194961, U.S.N.M.) Dredged at the Galapagos Islands in 40 fathoms.

Phos alternatus Dall, new species. Shell resembling *P. cancellatus* in a general way, but without the nodose-prickly sculpture. Whorls six with two or three nuclear turns in addition. Suture distinct, not deep, spire about as long as the aperture; sculpture of narrow, nearly straight, axial ribs with wider interspaces, about 22 on the last whorl, extending to the base; these are overridden by (between the sutures five) flattened, straplike spirals, with narrower channeled interspaces, in which are two or three very fine distinct spiral threads. The intersections are not nodulous, though the spirals are undulated where they cross the ribs. The outer lip is hardly thickened, not varicose but lirate within, the pillar simple with a sharp basal fold. Length, 26; width, 12 mm. (Cat. No. 212110, U.S.N.M.) This species like most of the others is occasionally banded with brown. The specimens examined are from the Gulf of California.

Phos mexicanus Dall, new species. Shell small, slender, not unlike *P. articulatus* Hinds, but without the articulations; with only 10 ribs on the last whorl instead of 14; with eight or nine whorls; the suture appressed, the spiral sculpture of flattish threads, larger and flatter on the base; between sutures two or three spirals more prominent than the rest and swollen where they pass over the axial ribs; aperture simple, lips not callous, pillar without a keel anteriorly; the canal short, the siphonal notch deep. Length, 23; diameter, 8.5; length of last whorl, 13 mm. (Cat. No. 212111, U.S.N.M.) Ranges from Cape St. Lucas to Panama.

Phos minusculus Dall, new species. Shell very small and thin, with about six whorls without the nucleus; whorls rounded, suture distinct, with two undulated spiral threads in front of it, and in front of them six flattened threads with wider channelled interspaces between the sutures on the penultimate whorl; these are not swollen when they cross the ribs, of which on the last whorl there are 14, with wider interspaces; there are no intercalary spirals; outer lip slightly varicose, with about 10 short internal lirae; labium smooth with no subsutural callus and no anterior keel on the pillar. Length, 12; diameter, 5; length of last whorl, 8 mm. (Cat. No. 122775, U.S.N.M.) Dredged in Panama Bay in 26 to 47 fathoms. This is the smallest species so far on record.

Genus NASSARINA Dall, 1889.

Nassarina solida Dall, new species. Shell small, solid, strongly sculptured, short-fusiform, dark brown, with white spots on the ribs in front of the periphery on the last whorl; there are about six rapidly increasing sculptured and three smooth nuclear whorls; sculpture of seven strong rounded axial ribs, obsolete on the base, overrun by, between the sutures, three very strong spiral cords, the most prominent pair being peripheral; the other, just in front of the appressed suture becomes obsolete on the last whorl; the whorl slightly in front of the latter cord is constricted, the constriction corresponding to a prominent callosity, or nodule on the inside of the outer lip; the entire surface is also covered by very fine uniform sharp spiral threads; the canal is short and slightly directed to the right; the aperture is small, the labium with a thin coarsely lirate callus and a large subsutural callosity; the outer lip beside the nodosity above referred to has five well-developed denticles and is internally thickened but not varicose. Length, 12; diameter, 6; length of aperture including the canal, 5 mm. Near La Paz, Gulf of California, in 8 fathoms. (Cat. No. 274095, U.S.N.M.)

Genus HINDSIA Adams, 1853.

Hindsia perideris Dall, 1910. Gulf of California, near La Paz.

Genus NORTHIA Gray, 1847.

Northia northiae Gray, 1833.

This is *Buccinum serratum* Dufresne, in Kiener, 1834, not of Brocchi, 1814; and *B. pristis* Deshayes, 1844. It ranges from the Gulf of California to Guayaquil.

In the proceedings of the United States National Museum, volume 26, page 350, I called attention to the fact that no species of *Gouldia* was yet known from the Pacific coast. Since then the supposed deficiency has been supplied by the discovery among some unworked small shells from the Gulf of California of a new species of that genus.

Genus GOULDIA C. B. Adams, 1847.

Gouldia californica Dall, new species. Shell small, thin, white, with touches of brown along the dorsal border, ovate-triangular, the anterior lateral tooth large and prominent, the pallial line hardly sinuated; sculpture reticulate, the concentric sculpture more prominent in the middle of the disk, the radial toward the ends of the valves; the inner valve margins smooth. Length, 6; height, 5.5; diameter, 3 mm.

Gulf of California near La Paz, in 21 fathoms. (Cat. No. 211736, U.S.N.M.)

This is a smaller and frailer species than either of those of the Atlantic coast.

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no. 32

SUPPLEMENTARY NOTES ON MARTYN'S UNIVERSAL CONCHOLOGIST

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BY

WILLIAM HEALEY DALL
Curator, Division of Mollusks, U. S. National Museum

No. 1565.—From the Proceedings of the United States National Museum,
Vol. XXXIII, pages 185–192

Published October 23, 1907

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SUPPLEMENTARY NOTES ON MARTYN'S UNIVERSAL CONCHOLOGIST.

By William Healey Dall,

Curator, Division of Mollusks, U. S. National Museum.

The publication of an account[a] of Martyn and his famous work on the shells of the South Seas by me in 1905, had the hoped-for effect, in that it was the means of bringing out supplementary information which enables me to supply data missing at the date of the first paper and to confirm conclusions which in it were arrived at by circumstantial evidence. Next to the positive determination that the first 80 plates were published in 1784, the most important data relate to the correction of the so-called reprint issued by Chenu of the tables for the second 80 plates, which turns out to be entirely unreliable. The new information comes from widely scattered sources.

The copy containing the first 80 plates, belonging to the Academy of Natural Sciences at Philadelphia, is about the same size as the National Museum copy ($12\frac{7}{8}$ by $10\frac{7}{8}$ inches) and is of the same date. It contains a publisher's circular offering the work separately printed on an octavo sheet dated 1787, and a manuscript note[b] stating that the Duke of York's copy sold for 10 guineas. The plates and tables agree with those of the Museum copy.

The second copy examined was sent from South Dakota by a collector who sold it to Mr. John B. Henderson, jr., of Washington, and likewise consisted of 80 plates elegantly bound. This was evidently one of the "select copies" of the first issue, as it is on folio sheets ($16\frac{1}{8}$ by $16\frac{1}{8}$ inches), and is dated after the first engraved title, "1784," and after the second engraved title has "MDCCLXXXIV | Tomkins scripsit | Ellis sc." | in small letters. This plate and the dedication are larger than those in the quarto edition and printed from a different engraved plate, although the wording is the same as in the quarto copies. There are no plates of medals. The text is worded the same as in the later issues, for the most part, but slightly differently distributed. On page 8, paragraph 2, after "South Seas," is added "comprising in all about 170 different species. The whole of which will be contained in four volumes, each volume exhibiting 40 shells or 80 figures." The later issues have only "The whole of which will be comprised in two volumes."

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[a] Proc. U. S. Nat. Mus., XXIX, 1905, No. 1425, pp. 415–432.

[b] Taken from an account of the sale in the London Times, May 24, 1827.

The Henderson copy, p. 8, footnote, asks that "correct copies of these" (i. e., drawings of unique shells for use in the work) may be sent to the author by "Christmas, 1785," in order to enrich the suite of these particular shells in this repository. This note, or a part of it, appears on page 6 of the quarto. Page 26 in the Henderson copy ends the text. Then follows the "Explanatory Table," worded as in the quarto, but engraved on a somewhat larger plate. The figures of shells follow, but, while they are the same species as in the quarto, they are in a few cases differently placed on the sheet, and the space inclosed by the neat-lines is larger.

Under the sheet of the Explanatory Table is inserted an octavo sheet of two pages, one English and one French, headed "Observations on the Explanatory Table." This sheet has not been seen in any other copy, but contains nothing of importance. It is chiefly devoted to remarks on the shells figured on plates 2, 14, 20, and 24.

The second forty plates forming "Volume II" have a copy of the 1787 circular inserted after the fly leaf, together with a note (with no headline), as follows: "As the four first volumes of this undertaking | form of themselves a distinct work and as such | may be preferred by some Persons: an additional | Title page is therefore added for such Purpose, leaving the other title page to be removed at | the Discretion of the Purchasers."

There is the same engraved title as for Volume I (first forty plates), no text, explanatory table the same as in the quarto.

The following differences are noted between the Henderson copy of the plates and the plates of the quarto:

Plate 43 has two views of shell. There is only one view in the quarto.

Plates 57 and 59; same remark.

Plates 61 and 63, the figures are side by side. In the quarto (owing to the smaller page?) they are placed diagonally.

All the other plates, except in regard to the neat-line, agree exactly with those of the quarto.

Mr. Charles Hedley, of the Australian Museum, informed me that they possess a complete copy with all the plates and also copies of the publisher's circular in octavo form, with French and English text for the issues of 1784 and 1786. These circulars are now known for 1784, 1786, and 1787. Mr. Hedley, with the concurrence of the Museum authorities, was kind enough to send me photographs of the circulars and also of the "Explanatory Tables" belonging to Volumes III and

IV, otherwise the third and fourth batches of 40 plates each. I have already called attention to the confusion caused by the publisher sometimes referring to 40 and at other times to 80 plates as a volume. The explanatory tables are marked Vol. I, II, III, and IV, respectively. I reproduce the English page of the earliest prospectus known to me, that dated 1784.

The words "This day is published" should not be taken literally, since they occur on each of the circulars. They simply mean that the books are on sale at the time of distribution of the circular, even when first issued earlier. The subsequent circulars differ but little in wording. They have the heading "Academy for Painting of Natural History," which is wanting on the circular of 1784.

For condition V of the 1784 circular that of 1786 has "That the subsequent volume, which is already in great part finished, shall be published some time in the spring, 1787."

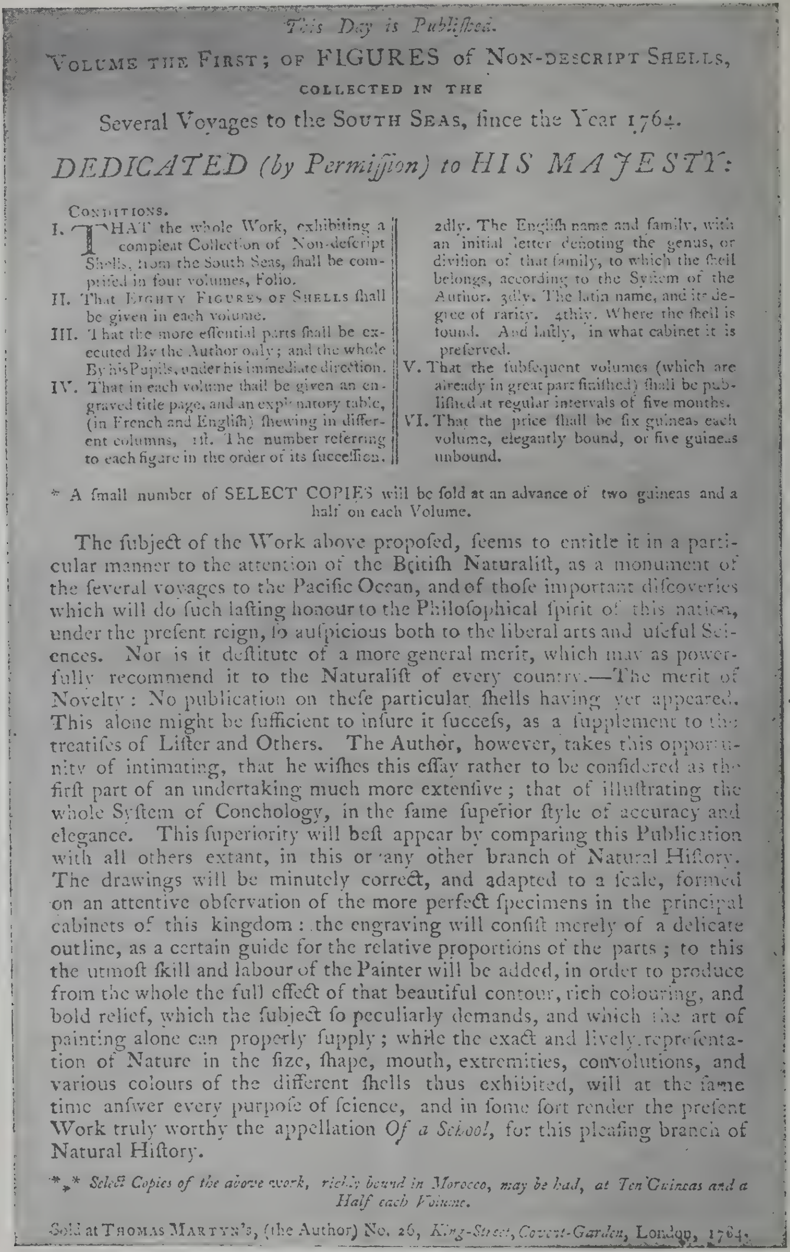
In the circular of 1787, after the line "This day is published," is inserted "(in two volumes compleat);" the paragraph numbered V in 1786 is omitted, and paragraph VI becomes V, while there is no paragraph VI.

The prices cited also vary. In 1786 the price is raised to "nine guineas each volume, in a rich extra binding; and ten guineas and a half in morocco. Unbound, seven guineas and a half. An edition of the above Work, elegantly bound in small Folio, may be had at five guineas and a half each volume." The same prices were asked in 1787.

In 1784 the author was situated at "26 King-Street, Covent-Garden," but in 1786 and 1787 the circulars place him at "16 Great Marlborough-Street."

The data above given prove conclusively that the first eighty plates appeared in 1784, the third forty in 1786, and the work was completed probably in the spring of 1787. Also that the date on the title-pages was changed at least twice, copies existing dated 1784, 1787, and 1789; and that a separate title-page was prepared for the first four volumes of South Sea shells when it became impossible to carry out the author's plan of issuing a general iconography.

The photographs of the "Explanatory Tables" of Volumes III and IV show such discrepancies between Chenu's "reprint" and the text it purports to represent that the suspicion arises that the original table may have been submitted to some revision and additions in a later issue; otherwise it seems impossible to account for Chenu giving in each case for these two volumes the generic name *Cardium*, when the original reads *Cochlea*, and specific names to species for which no specific name had been engraved in the compartment of the table intended to hold one.



This Day is Publiſhed.

VOLUME THE FIRST; OF FIGURES of NON-DESCRIPT SHELLS,
COLLECTED IN THE
Several Voyages to the SOUTH SEAS, ſince the Year 1764.

DEDICATED (by Permiſſion) to HIS MAJESTY:

CONDITIONS.

I. THAT the whole Work, exhibiting a compleat Collection of Non-deſcript Shells, from the South Seas, ſhall be compriſed in four volumes, Folio.

II. That EIGHTY FIGURES OF SHELLS ſhall be given in each volume.

III. That the more eſſential parts ſhall be executed By the Author only; and the whole By his Pupils, under his immediate direction.

IV. That in each volume ſhall be given an engraved title page, and an explanatory table, (in French and Engliſh) ſhewing in different columns, 1ſt. The number referring to each figure in the order of its ſucceſſion. 2dly. The Engliſh name and family, with an initial letter denoting the genus, or diviſion of that family, to which the ſhell belongs, according to the Syſtem of the Author. 3dly. The latin name, and its degree of rarity. 4thly. Where the ſhell is found. And laſtly, in what cabinet it is preſerved.

V. That the ſubſequent volumes (which are already in great part finiſhed) ſhall be publiſhed at regular intervals of five months.

VI. That the price ſhall be ſix guineas each volume, elegantly bound, or five guineas unbound.

* A ſmall number of SELECT COPIES will be ſold at an advance of two guineas and a half on each Volume.

The ſubject of the Work above propoſed, ſeems to entitle it in a particular manner to the attention of the Britiſh Naturaliſt, as a monument of the ſeveral voyages to the Pacific Ocean, and of thoſe important diſcoveries which will do ſuch laſting honour to the Philoſophical ſpirit of this nation, under the preſent reign, ſo auſpicious both to the liberal arts and uſeful Sciences. Nor is it deſtitute of a more general merit, which may as powerfully recommend it to the Naturaliſt of every country.—The merit of Novelty: No publication on theſe particular ſhells having yet appeared. This alone might be ſufficient to inſure it ſucceſs, as a ſupplement to the treatiſes of Liſter and Others. The Author, however, takes this opportunity of intimating, that he wiſhes this eſſay rather to be conſidered as the firſt part of an undertaking much more extenſive; that of illuſtrating the whole Syſtem of Conchology, in the ſame ſuperior ſtyle of accuracy and elegance. This ſuperiority will beſt appear by comparing this Publication with all others extant, in this or any other branch of Natural Hiſtory. The drawings will be minutely correct, and adapted to a ſcale, formed on an attentive obſervation of the more perfect ſpecimens in the principal cabinets of this kingdom: the engraving will conſiſt merely of a delicate outline, as a certain guide for the relative proportions of the parts; to this the utmoſt ſkill and labour of the Painter will be added, in order to produce from the whole the full effect of that beautiful contour, rich colouring, and bold relief, which the ſubject ſo peculiarly demands, and which the art of painting alone can properly ſupply; while the exact and lively repreſentation of Nature in the ſize, ſhape, mouth, extremities, convolutions, and various colours of the different ſhells thus exhibited, will at the ſame time anſwer every purpoſe of ſcience, and in ſome ſort render the preſent Work truly worthy the appellation *Of a School*, for this pleaſing branch of Natural Hiſtory.

*** *Select Copies of the above work, richly bound in Morocco, may be had, at Ten Guineas and a Half each Volume.*

Sold at THOMAS MARTYN's, (the Author) No. 26, *King-Street, Covent-Garden*, London, 1764.

PROSPECTUS OF MARTYN'S UNIVERSAL CONCHOLOGIST.

The following list gives Martyn's names for his Volumes III and IV. A comparison with the list in my first paper transcribed from Chenu's "reprint" will show the discrepancies. Several species have no specific name given to them. When the generic name is not engraved against the specific name but is indicated by the context it is placed in parentheses. In this and other respects the list agrees with the construction of my previous list. Specific names added by Chenu, but not in the original, are starred:

EXPLANATORY TABLE, VOLUME III.

PLATE 81. Buccinum ficus.
82. Buccinum vexillum croceum.
83. Buccinum coronatum.
84. Buccinum lineatum.
85. Buccinum tessellatum.
86. Buccinum nux-odorata.
87. Buccinum incisum.
88. Buccinum costatum.
89. Buccinum scabrum.
90. Buccinum turris picta.
Buccinum turris clavata.
91. Buccinum galea variata.
Buccinum galea ferrea.
92. Buccinum ornatum.
Buccinum luteolum.
93. Buccinum vittatum.
Buccinum varium.
94. Buccinum coelatum.
Buccinum sinuatum (omitted by Chenu).
95. Bulla circulata.
Bulla villosa.
96. Cyprea subfuscula.
97. Clava tessellata.
98. Clava nigra.
Clava fusca.
99. (Patella) scapula.
100. Patella testudineata.
101. (Patella) morionis-pileus.
102. (Patella) umbella.
103. Mitra rugata.
Mitra denticulata.
104. Mitra staminea.
Mitra fasciata.
105. Mitra limosa.
Mitra vermiculata.
106. (Nerita) nux-castanea.
107. Nerita acupictus.
108. Nerita diversicolor.
109. Nerita pellis-arminiana.
Nerita litteris Hebraicis notatus (hebræa*). See note *a*, page 196.

PLATE 110. Nerita stellatus.
Nerita fasciatus.
111. Oliva corticata.
Oliva striata.
112. Oliva interpuncta.
Oliva fenestrata.
113. Purpura scabra.
Purpura senticosa.
114. Purpura tubulata.
Purpura ramosa.
115. Limax aureus.
116. (Limax) tiara.
117. (Limax) lampas.
118. Limax vittatus.
119. Limax scaber.
120. Limax viperinus (serpens* Chenu).

EXPLANATORY TABLE, VOLUME IV.

PLATE 121. Limax spicatus.
(Limax) fusca spicatus.
(Limax, nigra spicatus (omitted by Chenu).
122. (Limax) flammeus.
123. (Limax) scutulatus.
124. Trochus petrosus.
125. (Voluta) fagina.
(Voluta) cosmographicus.
126. (Voluta) reticulata.
127. (Voluta) undata.
(Voluta) interpuncta.
128. (Voluta) ——— (ducis-navalis*).
129. Voluta scutulata.
(Voluta) zonaria.
130. Cochlea bicolor.
(Cochlea) nexilis.
131. (Cochlea) tigrina.
(Cochlea) aquosa.
132. (Cochlea) crista-galli.
(Cochlea) histrix.
133. Cochlea implexa.
(Cochlea) purpurea.
134. (Cochlea) triangularis.
135. (Cochlea) coocinea.
(Cochlea) dentrachates.
136. Cochlea nimbata.
(Cochlea) marmorata.
137. (Cochlea) cretata.[a]
(Cochlea) arborescens.
138. (Cochlea) russa.[b]
(Cochlea) palatam.
139. Cochlea undata.
(Cochlea) fumosa.

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[a] Marked with chalk. Martyn's English is "Figured cockle."

[b] Red or rosy.

PLATE 140. (Cochlea) nebulosa.
141. (Cochlea) castrensis.
142. { (Cochlea) virgulata.
(Cochlea) inscripta.
143. (Cochlea) ——— (albida*).
144. (Cochlea) viminea.
145. { (Cochlea) acupicta.
(Cochlea) maculosa.
146. (Cochlea) columbina.
147. (Cochlea) striata.
148. (Cochlea) gilva.
149. (Cochlea) violacea.
150. (Cochlea) personata.
151. { Musc(ulus) fuscus.
(Musculus) viridis.
152. { (Musculus) viridis undatus.
(Musculus) fuscus undatus.
153. { Pecten rubidus.
(Pecten) bombycinus.
154. Ostria echinata.
155. (Ostria) spinosa.
156. { Tellina cinnamar.
(Tellina) subrubicunda.
157. { (Tellina) alba.
(Tellina) rosea.
158. (Tellina) barbata.
159. { (Tellina) subrubicunda radiata.
(Tellina) purpurea radiata.
160. { (Tellina) adumbrata.
(Tellina) rubescens.

The discrepancies between the tables as reprinted exactly above and Chenu's list are so great that it does not seem reasonable to refer them merely to carelessness. In the absence of Chenu's original or a copy of it, and from the fact that the tables as reproduced by me from the Sydney copy are marred by engravers' errors—have two species without any specific name at all, and have thirty-six species with different generic names from those cited by Chenu—I conclude that the Sydney tables are an early issue of engravings which were later corrected and completed, and that it was from one of the altered copies that Chenu's badly printed list was taken, adding a number of errors of its own.

As illustrating engraver's errors in the Sydney tables, I need only mention as misspellings such words as *coocinea* for *coccinea*, *palatam* for *palatum*, and *ostria* for *ostrea*.

Other errors of the engraver consist in reversing the order of words as indicated by the English trivial names, putting the varietal name before the specific name, as *fusca spicatus* and *nigra spicatus* for *spicatus* var. *fusca* and *spicatus* var. *nigra*. In one instance the name intended for the specific name and the descriptive phrase have changed places in the columns, an error which seems to have been corrected in Chenu's original.[a]

One species and one variety are altogether omitted from Chenu's list, and the thirty-two bivalves placed in a genus *Cochlea* by Martyn, in his Volume IV, are listed by Chenu as *Cardium*, though the two *Cochlea* of Volume II remain. The four shells listed by Martyn as *Musculus* (i. e., *Modiolus* Lamarck) have the name *Mytilus* in Chenu's list. These facts point strongly toward a revision by Martyn himself of the original engravings of the tables for Volumes III and IV.

The importance of Volumes III and IV is fortunately confined to the specific nomenclature of the forms figured. Of these but a few are American. One comes from Newfoundland, one from the Straits of Magellan, and the rest of the American forms are from the West Indies. Nearly all of them had been given specific names before Martyn's time, and there are no Pacific coast species among them. Only Volumes I and II, or the first 80 plates (dating from 1784), are important for any generic synonymy. These are also the portions most frequently quoted by Bruguière, Gmelin, Lamarck, Deshayes, and other contemporary or nearly contemporaneous authors.

The present summary will enable those interested to form a correct idea of the earliest issue of Volumes III and IV (1786–87), not seen by me when I prepared my former paper on Martyn and the Universal Conchologist, and to positively confirm the priority of Martyn's names over those of Gmelin, Bruguière, and Lamarck, as indicated by that publication.

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[a] *Nerita hebræa*, Plate 109, second figure.

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SYNOPSIS OF THE FAMILY ASTARTIDÆ, WITH A REVIEW OF THE AMERICAN SPECIES.

BY

WILLIAM HEALEY DALL,
Honorary Curator, Division of Mollusks.

From the Proceedings of the United States National Museum, Vol. XXVI, pages 933-951
(with Plates LXII-LXIII).

[No. 1342.]

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1903.

SMITHSONIAN INSTITUTION.
UNITED STATES NATIONAL MUSEUM.

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The group of bivalve shells which composes this family is of ancient origin, the *Crassatellitidæ* having diverged from it in the later Mesozoic and taken definite form in the Eocene. The chief characteristic by which the two families are discriminated is found in the ligament, which in *Astartidæ* is external as well as the resilium, while in the *Crassatellitidæ* this organ is separated from the resilium, the latter, except in *Eriphyla*, being deeply immersed. In *Eriphyla* the process has only begun, but the other characteristics of the shell are so close to *Crassinella* that the two must obviously be associated in the same family. In *Lirodiscus* of the *Astartidæ* the resilium is separated from the ligament, but still remains external, while the other characters link it to *Astarte* in a way analogous to those which bind *Eriphyla* to the Crassinellas; so each family has an exceptional and peripheral group.

Concentric sculpture, dense periostracum, absence of bright color pattern, and a hinge formula of, in its fullest development, the following elements $\left(\frac{\mathrm{L0.101010.1}}{\mathrm{R1.010101.0}}\right)$ are characteristic of this family, as is its preference for cold waters, the tropical species keeping chiefly in the cold abysses or being dwarfed in size. The *Crassatellitidæ*, on the other hand, are prevalent in the Tropics and unknown in the cold seas.

I have not found more than three cardinals in either valve, and there are usually several nearly obsolete. The laterals are formed by an extension of the valve margin, which fits into a groove or socket in the opposite valve. These are usually alternated, one lateral and one socket to each valve. The middle cardinals are usually well developed and sometimes bifid, the anterior right and posterior left cardinals always (and the posterior right cardinal often) more or less obsolete. The sides of the cardinal teeth are frequently vertically striated, as in *Crassatellites*, especially in the fossil species.

No *Astarte* has radial ribbing, but many develop in the adult state crenulations on the inner margin of the valves. Some species are crenulate only when fully adult, others develop crenation at resting stages, others are always without them. The teeth of the hinge are frequently reversed as regards the valves. The laterals vary extremely in the fullness of their development, and the outline of the valves is also often very variable, most of the trigonal species having also elongated or oblique varieties. The conditions in the boreal seas, where these animals chiefly abound, seem to make for profusion in individuals and paucity of species, a state of things obviously favorable to individual variation.

The dullness of color characterizing the shells of this group is to some extent made up for by the bright colors of the soft parts which are usually yellow, orange, or vermilion. The anal siphon is short, complete, plain-edged and valvular. The branchial siphon is formed by apposition of the ciliate border of the free mantle edges. The foot is subquadrate, the gills small, reticulate, and free. The eggs are ripe in April in the latitude of Long Island Sound, and are discharged into the water for fertilization. The animals live partly immersed in mud or sand and form a large part of the food supply of the walrus and many fishes. The variability previously alluded to has made the identification of species difficult and their synonymy almost hopeless.

Dr. Jeffreys, who published much about the northern fauna, unfortunately was disposed to lump together rather than discriminate, not having the large series necessary for elucidating our American species. Sowerby's monographs of this group are very unsatisfactory and imperfect, covering less than half the known forms. The most successful attempt at a review of the species is that of Mr. Edgar A. Smith, of the British Museum, in 1881, in the Journal of Conchology.

I have found in reviewing our American species that a more narrow specific limitation removes some of the difficulties surrounding the subject. While assenting to many of the views heretofore expressed by naturalists, and disavowing any claim of finality for the decisions arrived at, I have endeavored to discriminate the recognizable American forms whether these be regarded as species or not. By adopting names for them we at least have the satisfaction of knowing what we mean when we employ a name, which is impossible under the system, or want of system, of Dr. Jeffreys. For the same reason I have been unable to avail myself of much work, systematic and distributional, which is in print, since it is impossible to know which of several forms is intended in a given case where a name covering a number of types has been used. The distribution mentioned in my list herewith is taken from actual specimens and only exceptionally from the literature. The collection of Astartes from the boreal regions of the New

World in the National Museum is exceptionally large, a fact upon which the possibility of a review of the species is dependent. In a general way the species common to both hemispheres belong to the circumpolar fauna; extremely few if any of the more southern species are common to Europe and America. In a general way each fauna has a set of species in which a given type is represented, but the representatives of the type when compared are found to be similar rather than specifically identical. Thus, the European *A. sulcata*, *compressa*, and *incrassata* do not in my opinion occur at all in America, though the Atlantic and Pacific faunas have analogues which are probably due to filling a particular similar niche in the environment rather than to any close connection with the types of Europe referred to.

The distinctions upon which the subordinate groups of *Astartidæ* are founded are chiefly the greater or less development of the hinge-teeth and modifications of external sculpture. As the type of the hinge formula does not change but merely submits to certain deductions from its possible total, it will be inferred that the subgenera or sections are not very widely separated.

The genus *Goodalliopsis* Munier-Chalmas and De Raincourt, 1863, is a synonym of *Kellia*. *Plesiastarte* Fischer, 1887, which has also been referred to this family, may perhaps be more suitably placed in the *Cyrenidæ*, if not a nepionic shell. *Præconia* Stoliczka, 1871, and *Pachytypus* Munier-Chalmas, 1887, I have not been able to examine; both are fossils. *Parisiella* Cossmann, 1887, from the figures, may be a member of this family and related to *Microstagon*. It is from the French Eocene. Paleozoic forms referred to *Astarte* are dubiously pertinent.

SUBDIVISIONS OF THE FAMILY.

Genus LIRODISCUS Conrad, 1869.

Shell solid, inequilateral, equivalve, the nepionic valves flat, usually concentrically ridged, the later portion of the disk more convex; ligament normal, external; residium separate, situated between the beaks, external, but with its base encroaching on the umbonal ends of the cardinals; dental formula $\frac{\mathrm{L01.1010.01}}{\mathrm{R10.0101.10}}$, the left anterior lateral often indistinct; inner margins crenate; adductor scars rounded with elevated margins.

Type *Astarte tellinoides* Conrad, Claibornian Eocene. This genus appears in the lowest Eocene and continues to be represented until the Jacksonian.

Genus ASTARTE Sowerby, 1816.

Synonyms: *Tridonta* Schumacher, 1817; *Crassina* Lamarck, 1818; *Triodonta* Agassiz, 1847; *Nicania* Leach, 1819; *Gonilia* Stoliczka, 1871; *Crassinella* Bayle, 1879, not Guppy, 1874; *Neocrassina* Fischer, 1887; *Grotriania* Speyer, 1860; *Digitaria* S. V. Wood, 1853; *Woodia* Deshayes, 1860; *Rictocyma* Dall, 1872; *Rhectocyma* Von Martens, 1874; *Goodallia* Turton, 1822; *Mactrina* Brown, 1827; *Microstagon* Cossmann, 1896; *Crenimargo* Crossmann, 1903.

Ligament enfolding the resilium, both external, on narrow nymphs.

Section *Astarte* s. s. Dental formula $\frac{\mathrm{L}0.101010.1}{\mathrm{R}1.010101.0}$, the middle right and two left anterior cardinals strong, the others obsolete; valves with convex umbones, subequilateral, the inner margins crenate when fully developed. Type, *Astarte sulcata* (Da Costa).

Section *Tridonta* Schumacher. Like *Astarte*, but the inner margins always smooth. Type, *T. borealis* Schumacher, 1817.

? Section *Neocrassina* Fischer. Like *Astarte*, but the umbones nearly terminal in front. Type, *A. obliqua* Deshayes. Bajocien Oolite.

Section *Rictocyma* Dall. Small, like *Astarte*, but the valves with irregular bifid or broken sculpture; inner margins not crenate. Type, *A. esquimalti* (Baird).

Section *Ashtarotha* Dall, 1903. Umbones concentrically sculptured and conspicuously flattened; disk smoother outside of the flattened area; otherwise like *Astarte*. Type, *Astarte undulata* Say, Miocene. *A. bipartita* Sowerby, 1829, appears to belong here.

Section *Gonilia* Stoliczka. Small, lentiform, hinge as in *Astarte;* disk with divaricate ribbing centrally. Type, *Lucina bipartita* Philippi, 1839 (=*Astarte bipartita* Stoliczka, 1871, not of Sowerby; = *Astarte calliglypta* Dall, 1903).

Section *Digitaria* S. V. Wood. Valves rotund, shell small, lentiform, hinge as in *Gonilia*, having the larger cardinals bifid; surface obliquely, arcuately sulcate, the sulci grooving more or less the inner margin tangentially; *Woodia* Deshayes is synonymous. Type, *Tellina digitaria* Linnæus.

Section *Crenimargo* Cossmann. Shell like *Digitaria*, but the surface smooth; the tangential sulcations of the inner margin are, however, retained as in *Transennella;* hinge as in *Digitaria.* Type, *C. inæquicrenata* Cossman, Parisian Eocene.

Subgenus **Goodallia** Turton. Shell small, smooth, the hinge teeth reduced by the absence of the anterior or posterior right cardinal or both of them; inner margins crenate at resting stages only; dental formula $\frac{\mathrm{L}0.101.1}{\mathrm{R}1.010.0}$. Type, *Mactra triangularis* Montagu. *Mactrina* Brown is synonymous.

Section *Microstagon* Cossmann. Like *Goodallia*, but the hinge usually with one or both laterals obsolete and a small (usually anterior) right cardinal present, which is not found in *Goodallia* proper.

Formula $\frac{\mathrm{L.1010.}}{\mathrm{R.0101.}}$ (*herouvalense*) or $\frac{\mathrm{L.1010.1}}{\mathrm{R.010\overline{1.0}}}$ (*pernitidum*). Type, *Goodallia herouvalensis* Deshayes. Eocene of Paris.

In considering the distribution of the species the following table may aid in grasping its chief features. The East American fauna here is that south of Greenland, the West American that south of Bering Strait. The Arctic fauna includes those north of those limits, an asterisk denoting that the species is confined to the limits of its fauna as above defined.

ARCTIC AMERICAN FAUNA.

A. undata.
A. subæquilatera.
A. crenata.
A. polaris.
T. arctica.
T. borealis.
T. fabula.
T. bennettii.
T. vernicosa.
T. elliptica.
*T. acuticostata.**
*T. globosa.**
*T. pulchella.**
*T. banksii.**
T. striata.
T. soror.

WEST AMERICAN.	EAST AMERICAN.
A. polaris.†	*A. subæquilatera.*†
*T. rollandi.**	*A. castanea.**
T. arctica. †	*A. undata.*
T. borealis.†	*A. crenata.*†
*T. alaskensis.**	*A. smithii.**
*T. compacta.**	*A. globula.**
T. fabula.†	*A. nana.**
T. bennettii.†	*A. liogona.**
T. vernicosa.†	*T. borealis.*†
*R. esquimalti.**	*T. elliptica.*†
	*T. quadrans.**
	T. striata.†
	T. soror.†

ANTARCTIC FAUNA.

Astarte longirostra.

From this it will be observed that the typical Astartes, which are rather abundant on the shores of Europe, compared with the Tridontas, are in the majority on the Eastern coast, but in the Arctic they form a much smaller proportion, and only one reaches the West American fauna. *Rictocyma* is confined to the latter. In this hemisphere the Arctic fauna has 4 peculiar species, Eastern America 6, and Western America only 4. Only one species, *A.* (*Tridonta*) *borealis*, is common to all three of the northern faunas. If we eliminate from the east and west faunas those really arctic species which invade them from the north (and which are marked with a dagger in the table), we find only the peculiar species left, except in the case of *A.*

undata, which occurs in Greenland, but is very rare there, and really is characteristic of the fauna farther south.

The *Astarte* fauna of the American hemisphere thus consists of 27 species, 1 being Antarctic, 16 Arctic, 13 East and 10 West American. Doubtless a more thorough exploration of the arctic and abyssal seas in both oceans might add a few more species and somewhat change the above figures.

In the geographical lists which follow the names have appended to them the date of description. The more detailed references, if desired, may be had from the bibliography in the Journal of Conchology for 1881, given by Mr. Edgar A. Smith, pages 201–204.

The plates contain figures of the newly described or unfigured forms.

LIST OF THE SPECIES OF THE EASTERN COAST.

ASTARTE CASTANEA Say, 1822.

Coast of Nova Scotia and southward to the vicinity of Cape Hatteras, North Carolina, in 5 to 65 fathoms.

A variety, *picea* Gould, 1841, has blackish tarry periostracum. It has been collected at Chelsea Beach, Massachusetts, and Sandy Hook, New Jersey. The typical form is smooth, equilateral, polished, of a rich reddish chestnut brown, and with sharply crenate margins.

Totten described a variety, *procera*, from Provincetown Harbor, Massachusetts, in 1835. It is characterized by a dull yellow brown periostracum and obliquely produced high beaks. It would seem that the peculiar environment is connected with these characters, as the locality is so isolated as to be almost like an oceanic island, and on the Pacific coast on such islands exclusively a variety of *A. rollandi* is found differing from the type in the same way.

ASTARTE UNDATA Gould, 1841.

Greenland and adjacent arctic waters, and south to Massachusetts Bay, and in deep cold water to the vicinity of Chesapeake Bay. The range in depth is from 5 to 104 fathoms.

Dull chestnut brown, subtrigonal as a rule, but variable in outline, with 10 to 25 concentric ripples, sometimes obsolete near the ventral margin. When the ripples are few, prominent, and distant, we have the variety *latisulca* Hanley, 1843, of which perhaps *A. mortoni* Sowerby, 1874, is a mutation. This species was mistakenly identified with the European *A. sulcata* Da Costa by early American writers and by Jeffreys. A pale variety was named *A. lutea* by Perkins in 1869.

ASTARTE SUBÆQUILATERA Sowerby, 1854.

Davis Strait and southward, usually in rather deep water, along the eastern coast of the United States to the vicinity of Cape Florida, in 22 to 410 fathoms.

This species was named by Stimpson in manuscript *A. lens*, and this name, though never described, has found its way into the literature. Through Dr. Jeffreys it has also been confounded with *A. crenata* Gray and *A. crebricostata* Forbes, neither of which is closely related to it. The shell is ovate, compressed, pale or yellowish brown, the deep-water specimens sometimes nearly white, and it is sculptured with numerous even, low, concentric ripples, which are obsolete in the adult behind. Specimens reach a length of 39, with a height of 31 and a diameter of 10 mm.

ASTARTE (SUBÆQUILATERA var?) WHITEAVESII Dall, 1903.

Gulf of St. Lawrence and south to Long Island Sound, in 67 to 428 fathoms.

This, which is the *crebricostata* of Dawson,[a] has also been called *crenata* and *lens*, while I find it labeled by Jeffreys "*sulcata* variety *nana*," though it has no close resemblance to *sulcata* Da Costa. It resembles the young of *subæquilatera*, but is more convex; has the concentric sculpture continued to the margin behind, and is, on the whole, rather darker in color. It was dredged abundantly by Whiteaves at Gaspé, in 200 fathoms.

ASTARTE POLARIS Dall, 1903.

Polar Sea, dredged off Hare Island, Davis Strait, in 90 fathoms, and is also found near Bering Strait.

Plump, subtrigonal, with olive-brown periostracum, thin shell, deeply excavated lunule, and delicate hinge. The sulcation of the margin appears only with complete maturity. The concentric sculpture is fine, close, and low, sometimes degenerating into mere striation. Externally the shell recalls *Corbicula*.

ASTARTE CRENATA Gray, 1824.

Shannon fiord, East Greenland (as *crebricostata* Moebius); Prince Regent Inlet, Melville Island and adjacent waters (Parry); and south to the Gulf of St. Lawrence, in 16 to 200 fathoms.

Some of the specimens collected by the Parry expedition, from which Gray described the species, are fortunately in the Jeffreys collection and enable me to fix this species, which has also been named *A. oblonga* by Sowerby in 1854. It appears to be rare, and is a thin, inflated, elongate-oval shell, delicately, closely, concentrically striated or grooved, with the sculpture often obsolete below and stronger near the beaks. It is a smaller, thinner, and much more inflated shell than *subæquilatera*, and of a pale straw color or light brown color somewhat polished when in fine condition.

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[a] Can. Nat., 1872.

ASTARTE SMITHII Dall, 1886.

Gulf of Mexico, Cuba, Martinique, Barbados, and Campeche Bank, in 54 to 450 fathoms, bottom temperature 53° to 65° Fahr.

Shorter, more inflated, paler, and with ribs of a different shape from those of *subæquilatera* or *whiteavesii* of about the same size. It is sharply crenate, while the young of the other species referred to, at an equivalent growth, are usually without crenations. The species was named in the Blake report.

ASTARTE GLOBULA Dall, 1886.

Off Fernandina, Florida, in deep water, south to the coast of Cuba, and in the Gulf of Mexico, in 294 to 539 fathoms. One valve, perhaps drifted, in 1,568 fathoms.

Of the same general type as *A. smithii*, but perfectly smooth and attaining a larger size. The margin is sharply crenate and the color grayish white. It was at first supposed to be a smooth variety of *smithii*, but more material indicates that it is distinct.

ASTARTE NANA (Jeffreys MS.) Dall, 1886.

Cape Hatteras, North Carolina, and south to the Florida reefs and Sombrero Island, West Indies, in 6 to 227 fathoms; temperature, 51° Fahr.

This shell is somewhat larger and flatter than *A. smithii*, with more erect and prominent beaks, and the ribs cover the whole shell; it is crenate only when perfectly mature; the color varies from light yellow brown to rose pink. A still more convex and triangular form occurs among the specimens dredged in the Gulf of Mexico, and among the Florida reefs in 25 to 60 fathoms, which was labeled by Jeffreys variety *trigona*.

ASTARTE LIOGONA Dall, 1903.

Near the delta of the Mississippi River, in the Gulf of Mexico, at 118 fathoms, muddy bottom.

A single specimen of a small olivaceous species was dredged as above. It differs from all those hitherto known on the coast, by having the beaks and main part of the disk smooth, while near the margin are a few distinct narrow concentric ribs. The inner margin is sharply crenate.

Section TRIDONTA Schumacher.

ASTARTE ARCTICA Gray, 1824.

Vadsö, Norway; the Arctic Atlantic, Davis Strait, and Greenland, in 15 to 60 fathoms. Also near Bering Strait.

This convex and smooth form is well distinguished from the *A. borealis*, and is wholly destitute of concentric ribbing. It is a circumpolar species and of a dark blackish brown color. It has very generally united with *borealis*, doubtless for want of a sufficient series for comparison. It is the *corrugata* and *depressa* of Brown, 1827; according to Sowerby, the *cyprinoides* of Duval, 1841; the *islandica* of Deshayes (MS.), 1867; the *lactea* and *subtrigona* of Sowerby, 1874. It is somewhat variable in outline, but the other characters are fairly constant.

ASTARTE BOREALIS Schumacher, 1817

Bennett Island, Polar Sea; North Europe and the Baltic, Arctic Atlantic, Iceland, and Greenland, and south to Massachusetts Bay, in 15 to 100 fathoms. Also Bering Sea and Strait, etc.

Shell compressed, with the beaks concentrically ribbed; the rest of the disk more or less smooth. This is the *semisulcata* of Leach, 1819; the *veneriformis* Wood, 1828; the *lactea* of Broderip and Sowerby, 1829. According to authors it is the *withami* of J. Smith, 1839; and *producta* Sowerby, 1874, is synonymous. The young have been named *richardsonii* by Reeve, in 1855; *placenta* (Mörch) and *rhomboidalis* Leche, Vega Exp., Lamellibranchiata, 1883.

ASTARTE ELLIPTICA Brown, 1827.

North Europe, Arctic seas near Greenland, and south to Massachusetts Bay, in 8 to 90 fathoms.

An elegantly ovate subcompressed shell, with rather low beaks, the upper half of the disk concentrically rippled, the lower part smooth or feebly striated. The color varies from warm yellow brown through chestnut to blackish. It is the *ovata* of Brown, 1827, the *garensis* of J. Smith, 1839, and the *intermedia* of Sowerby, 1854. It has sometimes been referred to *Venus compressa* Linnaeus, but this is a mere hypothesis, incapable of verification, and should be rejected.

ASTARTE QUADRANS Gould, 1841.

Gulf of St. Lawrence to Long Island Sound in 6 to 40 fathoms.

A small, smooth, compressed, quadrate species, which has not been characteristically figured. The inner surface of the shell is usually white, but sometimes dark colored. A specimen of this sort was named *A. portlandica* by Dr. Mighels in 1843. I find it labeled "*A. castanea* variety *nana*" by Jeffreys. It is not a common species.

ASTARTE ACUTICOSTATA Jeffreys and Friele, 1877.

Arctic Atlantic, in deep water, Jan Mayen and Novaia Zemlia, in 200 to 649 fathoms.

A small quadrate species, with fine, regular, well-marked, concentric ribbing all over the shell.

ASTARTE GLOBOSA Moller, 1842.

East and West Greenland, and adjacent Arctic waters, in 10 to 150 fathoms.

Small, blunt, ventricose, yellow brown, the anterior end longer, rounded, the posterior end subtruncate, the surface closely, finely, concentrically sulcate all over. The species was identified as *compressa* by Moebius, 1874, and Jeffreys called it *compressa* variety *striata*. It is one of three or four related forms fairly recognizable which have been usually "lumped" under one name. Nothing which can be properly identified with the British *A. compressa* is known from American waters.

ASTARTE FABULA Reeve, 1855.

Franz Josef Land to Greenland and adjacent Arctic waters in 12 to 90 fathoms. Also in the Polar Sea, near Bering Strait.

A thin elongate-ovate, inflated species, with the posterior end slightly longer, the umbonal region peculiarly, squarely, concentrically sulcate, and the basal portion striated. The color is usually dark brown. It was described by Sowerby in 1874, as *A. semilirata*, and has frequently been identified as *A. banksii*, but it is not *A. banksii* of Leach.

ASTARTE PULCHELLA Jonas, 1845.

Hogarth Sound, Cumberland Inlet, and adjacent Arctic waters, also Novaia Zemlia, in 5 to 10 fathoms.

Ovate, thin, polished; evenly, concentrically, elegantly sulcate, with narrow lanceolate lunule; the color light brown, and the beaks nearly central. It is the *A. warhami* Hancock, 1846.

ASTARTE BANKSII Leach, 1819.

Baffin's Bay and adjacent waters to lat. 80° N., also Spitsbergen, in 12 to 60 fathoms.

Mr. E. A. Smith has shown that the numerals of the figures of *striata* and *banksii*, Leach, in Beechey's Zoology of the Voyage of the Blossom, are exchanged and the figure formerly referred to *striata* represents *banksii* and *vice versa*. This confusion runs through much of the literature. Specimens of *A. banksii*, which is a nearly smooth species of a reddish brown or olivaceous tint, were labeled *compressa* variety *striata* by Jeffreys.

ASTARTE STRIATA Leach, 1819.

Baffin's Bay, Davis Strait, and adjacent waters, and south to the Grand Banks, the Gulf of St. Lawrence, and Massachusetts Bay, in 10 to 85 fathoms.

Subtrigonal, with somewhat coarsely sulcate umbonal region, the ventral margin in the adult merely striated. It is the *banksii* of many authors and is figured under that name in Binney's Gould, 1870, and regarded as a variety of *A. compressa* by Jeffreys.

ASTARTE (LAURENTIANA Lyell, 1845, var.?) SOROR Dall.

Type in the Leda clays and other Pleistocene beds of eastern Canada and New England; variety *soror*, from 82° north latitude through the Arctic waters southward to the Gulf of St. Lawrence in 5 to 90 fathoms.

The recent shell is more trigonal, larger, and the concentric sculpture coarser than that of the typical Pleistocene fossil. I adopt the above varietal name for the recent form until more is known, but I suspect the species are distinct.

LIST OF THE SPECIES OF THE WESTERN COAST.

ASTARTE POLARIS Dall, 1903.

Kyska Harbor, Aleutians; Constantine Harbor, Amchitka; and near the Shumagin Islands, in 10 to 58 fathoms, mud or sand, bottom temperature 41° to 45° F. Also in Baffin's Bay, on the Greenland coast.

This is the only typical *Astarte* so far identified on the northwest coast.

ASTARTE LONGIROSTRA D'Orbigny, 1847.

Falkland Islands, D'Orbigny; Straits of Magellan, in 20 to 61 fathoms, bottom temperature 48° F.

The *A. magellanica* Smith, 1881, judging from the specimens dredged by the U. S. Fish Commission steamer *Albatross*, varies so that the distinctions relied on to separate it from *A. longirostra* disappear in a good series. The name *magellanica* might, however, be retained in a varietal sense for the specimens with more pronounced sculpture and less protracted beaks. This is the only species recorded from the southern hemisphere.

Section TRIDONTA Schumacher.

ASTARTE ROLLANDI Bernardi, 1858.

Avatcha Bay, Kamchatka, and eastward through the Aleutian and Pribilof Islands, and along the Alaskan coast to Prince William Sound, in 8 to 27 fathoms.

Suborbicular, nearly smooth, large and heavy, with dark chestnut-brown periostracum, which in the adults is dehiscent on drying. This species takes the place in the western fauna occupied by *A. castanea* on the eastern coast, and, like it, has a pale oblique variety (*loxia* Dall, 1903), which is found on oceanic islets, Chika, the Semidis, and Middleton, in 12 to 25 fathoms, sand.

ASTARTE ARCTICA Gray, 1824.

Bering Strait, Bering Sea, and the Aleutian Islands from Attu to Unalga Pass east of Unalaska in 15 to 60 fathoms; also in the eastern arctic waters.

See the eastern list for synonymy and further data.

ASTARTE BOREALIS Schumacher, 1817.

Polar Sea, near Bennett Island; *Jeannette* expedition. Macfarlane Bay, near the mouth of the Mackenzie; Bering Strait and southward on the American side to Port Etches, Prince William Sound, and on the Asiatic side to Yokohama.

For synonymy, etc., consult the eastern list. The variety *rhomboidalis* Leche, 1883, as figured, is based on an immature specimen, while the variety *placenta* Mörch is simply the young shell of the normal type. A somewhat elongated specimen figured under the name of *A. scotica* by Middendorff, Plate XVI, figs. 10–12, 1849, may be the young of this species or an unusually strongly ribbed *elliptica.* He gives localities from Lapland to the Okhotsk Sea. The latter were probably *borealis;* the former might have been *elliptica.* His figures on Plate XVII of the same name are probably *A. sulcata.* Figs. 6 to 7 on the same plate under the name of *corrugata* Brown are probably *A. borealis*; figs. 4, 5, 8, 9, and 10, perhaps, are dilapidated *A. rollandi.* In the Sibirische Reise, Plate XX, figs. 1 to 4, 1851, which are named *A. scotica*, represent *A. borealis*, and it is evident he regarded the two as synonymous. *A. compressa*, on the other hand, he does not record from eastward of the Taimyr River. The Macfarlane Bay specimens are exceptionally smooth, compressed, and thin.

ASTARTE ALASKENSIS Dall, 1903.

Southern part of Bering Sea, the vicinity of the Shumagin Islands, and eastward along the Alaskan coast and south to Puget Sound in 10 to 70 fathoms. Also in the glacial drift of Sucia Island, Straits of Georgia.

Much resembling *A. elliptica* of the eastern coast, but shorter, heavier, and more trigonal. The periostracum is black or dark brown and dehiscent when dry. It has usually been identified as *undata* but is never crenulated.

ASTARTE COMPACTA Carpenter, 1865.

Puget Sound, Kennerley, and Johnson.

Small, stout, trigonal, like *A. esquimalti*, but with regularly arcuate, uniform concentric ribbing. It was described as a variety of *A. compressa* Montagu, which does not occur on the coast. It appears to be rare, and I have seen only one specimen beside the type. The former is figured, Plate LXIII, fig. 8.

ASTARTE FABULA Reeve, 1855.

Polar Sea, near Point Belcher, and south to the north end of Nunivak Island in 15 to 23 fathoms. Also in the eastern hemisphere at Franz Josef Land, the coast of Greenland, etc.

Leche's figures of "*A. warhami*" in his report on the Vega lamellibranchs indicate that he probably included this species under that name. *A. semilirata* Sowerby, 1874, is synonymous. For other data see eastern list.

ASTARTE BENNETTII Dall, 1903.

Polar Sea at Bennett Island, *Jeannette* expedition; also in Bering Sea, 5 miles west of Nunivak Island, in 24 fathoms, Dall.

Small, solid, rather uniformly concentrically striate; polished, olivaceous, with high beaks. Leche's figures 11 and 12, Plate 32, may have been taken from a specimen of this species, with the posterior end rather blunter than usual, and not full grown. In the Bering Sea specimen the striation is stronger near the beaks.

ASTARTE VERNICOSA Dall, 1903.

Arctic Sea and northern part of Bering Sea, from Icy Cape to Hagemeister Island, in 7 to 28 fathoms, and southern part of Bering Sea, through the Aleutians from Attu to Atka, in 8 to 14 fathoms.

Resembling *A. fabula*, but more coarsely and uniformly sulcate and brilliantly polished, with an olivaceous yellow-brown periostracum, narrower, longer, and less impressed lunule.

Leche's figures 7 to 8, Plate 32, apparently represent this species.

Section RICTOCYMA Dall.

ASTARTE ESQUIMALTI Baird, 1863.

Aleutian Islands from Unalaska eastward along the coast of Alaska and south to Puget Sound in 6 to 80 fathoms.

Recognizable by its irregular sculpture, and reaching a height of 21, with a length of 23 and a diameter of 11 mm. *R. mirabilis* Dall, 1872, was based on a young specimen of this species.

DESCRIPTIONS OF THE FORMS NEWLY NAMED.

ASTARTE POLARIS, new species.

Plate LXIII, fig. 5.

Shell rounded-trigonal, moderately thick, bluish white, covered with a slightly polished light-brown periostracum; valves moderately convex, with the umbones high, somewhat prosogyrate, over a well-impressed lanceolate lunule, which is unequally divided, the right valve bearing the larger share; escutcheon narrower and longer than the lunule, impressed, smooth; sculpture of forty or more small, narrow, regular, concentric riblets separated by about equal interspaces; in the adult the posterior slope and ventral third of the disk have the riblets replaced by somewhat uneven concentric striation; interior smooth, the inner margins finely evenly crenate; hinge rather solid, the middle cardinal in each valve grooved or bifid. Height, 25; length, 28; diameter, 15 mm.

The type specimen, No. 106859, is from 51 fathoms, sand, near the Shumagin Islands, Alaska. The nearest form to this is *A. sulcata* var. *multicostata* Jeffreys, which in form and outline approaches it very closely, but differs by sparser ribbing, which is also more regular and extends over the whole shell.

ASTARTE ALASKENSIS, new species.

Plate LXIII, fig. 2.

Shell ovate, subcompressed, white, with a dark, strong, caducous periostracum, which, like that of *A. elliptica*, becomes black in the dead or senile shells; valves quite inequilateral, beaks at the anterior third, elevated, slightly compressed, prosogyrate; lunule excavated, sublanceolate, the escutcheon longer and wider; sculpture of about a dozen concentric riblets with wider interspaces, more feeble near the ventral and posterior margins; inner margins entire, smooth; hinge solid, the teeth narrow and entire. Height, 26; length, 31.5; diameter, 14 mm.

Type specimens from northwest of Unimak Island, in the southern part of Bering Sea, at a depth of 70 fathoms; bottom temperature 39° F. U.S.N.M., No. 109274.

ASTARTE BENNETTII, new species.

Plate LXIII, fig. 6.

? *Astarte warhami* Leche, Vega exped., III, 1883, p. 442, pl. XXXII, figs. 11 and 12 (only).

Shell small, thin, subcuneate, subcompressed, with a polished olivaceous periostracum; posterior end shorter, bluntly rounded; anterior end longer, more sloping and direct dorsally, rounded; base nearly straight in the young; surface finely concentrically striate, or nearly smooth, the striæ more apparent on the beaks; lunule narrow, lanceolate, impressed, escutcheon similar, a little longer than the lunule; beaks high, slightly prosogyrate; hinge delicate, the large cardinals slightly grooved above, the laterals apparent; pallial line rather near the margin, which is not crenulate. Height 10.5, length 11.5, diameter 5.0 mm.; Bering Sea specimen height 14.5, length 15.0, diameter 7.0 mm.

In the terrible retreat from the Jeannette over the arctic floes Mr. Newcombe, the naturalist of the expedition, retained a small packet containing a few specimens of natural history from the most northern land reached, Bennett Island. Among these were a fragment of *Astarte borealis* and a single perfect specimen of the present species,[a] U.S.N.M., No. 83221. A single other specimen was obtained by me within the limits of the arctic fauna in the northern part of Bering Sea, in 24 fathoms. Leche's figure is slightly more oblique and convex, but very probably represents the same species.

ASTARTE (LAURENTIANA var.?) SOROR, new species.

Plate LXII, fig. 11.

Shell of moderate size, subequilateral, rounded-trigonal or cythereiform, the beaks moderately elevated, full and prosogyrate; the anterior end slightly shorter, the lunule rather small, lanceolate and impressed, the escutcheon similar but longer; surface covered with fine, rather harsh concentric sulci with subequal interspaces, very uniform over the surface; periostracum dull, of a dark brown color, sometimes paler or olivaceous in the young; hinge delicate, laterals distinct, large cardinals sulcate or striated above; inner margins entire. Height 18.0, length 21.5, diameter 10.0 mm.

This species differs from *A. fabula* by the sculpture of its umbones and the sulcation of the whole disk externally; it has the same kind of sculpture as *A. laurentiana* but coarser and more harsh to the touch; the form in general is more trigonal or rounded than in *A. laurentiana*, but this is variable and some specimens agree well in shape. *A. polaris* is distinguished by deeper excavation of the lunule, smoother and more open sculpture, and the crenation of the inner margins.

This is the species of which young individuals have been taken for recent specimens of *A. laurentiana*, but which I am inclined to regard as distinct, especially since no fossil *laurentiana* approach it in size. Jeffreys included it, with a number of other things which appear to me distinct, under the name of *A. compressa* var. *striata*. The type locality is Godhavn Harbor, Disco Island, Greenland. U.S.N.M., No. 109278.

The typical *A. laurentiana* was described by Lyell in his Travels in North America in 1845. In the American edition, published the same year, it can be found figured, page 125, figs. 15a–15c, and described on page 126 of the second volume, a reference which I had some difficulty in finding and which was kindly supplied by Dr. Whiteaves. It is found in the Pleistocene clays of the St. Lawrence Valley.

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[a] The other molluscan specimens included egg cases of *Bela* sp., *Chrysodomus* sp., and *Natica* sp., and fragments of *Liocyma fluctuosa* Gould, *Modiolaria nigra* Gray, and *Yoldia abyssicola* Torell; U.S.N.M., Nos. 83220–83227.

ASTARTE SUBÆQUILATERA var. WHITEAVESII Dall.

Plate LXII, figs. 7, 12.

Shell rounded quadrate, plump, inequilateral, the anterior end shorter; concentrically sculptured with 20 to 25 sharply defined rounded ribs with wider channeled interspaces, the ribs continuous over the whole shell; periostracum thin and papery, of a pale yellowish brown; lunule and escutcheon smooth, lanceolate, moderately impressed; inner margins, when adult and at resting stages, crenate, hinge strong, the cardinals entire. Height 12, length 14.5, diameter 6.5 mm.

Type locality, Gaspé, Whiteaves, in 200 fathoms. U.S.N.M., No. 95748.

The continuous ribs behind, more convex valves, and smaller size distinguish this variety from the typical *subæquilatera* of Sowerby or the *lens* of Stimpson.

ASTARTE LIOGONA, new species.

Plate LXII, fig. 9.

Shell small, compressed, rounded trigonal, beaks erect, somewhat eroded in the type, umbonal region (outside of the eroded tract) smooth or marked only with incremental lines, but near the base there are indications of five narrow rounded concentric ribs, with wider interspaces; periostracum olivaceous, rather dark; lunule lanceolate, moderately impressed, smooth; escutcheon narrower and longer; ligament short; hinge moderately strong, the teeth entire, inner margins strongly crenulate. Height 7.0, length 7.5, diameter 4.0 mm.

Dredged in 118 fathoms, near the delta of the Mississippi, on a muddy bottom. U.S.N.M., No. 64434.

If this specimen is characteristic it differs from any other known to me in having the umbonal region smooth, while the peripheral portion exhibits raised ribbing.

ASTARTE VERNICOSA, new species.

Plate LXIII, fig. 1.

Astarte warhami (Hancock) Leche, Vega exped., III, 1883, pl. xxxii, figs. 7–8 (only) 1883.

Shell small, subcompressed, subtrigonal, subequilateral, covered with a brilliantly polished olivaceous brown periostracum; beaks rather high, slightly prosogyrate, the lunule narrow, lanceolate, impressed, the escutcheon similar but longer; base arcuate, anterior end rounded, posterior end slightly more produced; hinge delicate, inner margins smooth, hinge teeth much as in *A. bennettii*. Length 17.0, height 15.0, diameter 6.7 mm.

Type locality, off Icy Cape in 15 fathoms sand, W. H. Dall. U.S.N.M., No. 109276.

Our specimens are somewhat more trigonal and attenuated behind than in Leche's figures. The sculpture is of quite even and regular sulcations which usually are somewhat less pronounced on the ventral third of the disk, but never present the striking contrast between the sulcate and unsulcate portions which may be usually noted in *A. fabula*. In many cases, however, the sculpture is continued to the base without obsolescence, almost as evenly as in Hancock's *warhami*, but the shape of the valves is different and the present species is much less inflated. Leche's figures 9 and 10 appear to represent *A. fabula*, of which occasional specimens are sulcate clear to the base, but which can usually be recognized by the squarish and slightly wavy appearance of the concentric umbonal sculpture.

ASTARTE (RICTOCYMA) ESQUIMALTI Baird.

Plate LXIII, figs. 11, 12.

This species having been figured only imperfectly, better figures are now supplied from an adult specimen (U.S.N.M., No. 106862), dredged near the Shumagin islands in 58 fathoms.

VENERICARDIA CRASSIDENS Broderip and Sowerby.

Plate LXIII, fig. 9.

Astarte crassidens Broderip and Sowerby, Zool. Jour., IV, 1829, p. 365.

Icy Cape, Belcher, in Bland's collection (Broderip and Sowerby.)

This species is described as "obsoletely radially sulcate," much eroded at the umbones, with a large striated cardinal in either valve and with the margins coarsely crenulate, the crenulations having "almost the appearance of low embrasures." It is represented as reaching a length of 40, a height of 41, and a diameter of about 21 mm., with a tinge of dull reddish purple in the center of the valves inside and the umbones nearly terminal and anteriorly directed.

Now, these characteristics are not those of an *Astarte*. All our Arctic Astartes are white within; none is radiately sulcate: none has embrasure-like crenations. Moreover, the vicinity of Icy Cape has been pretty well dredged at various times, and *Astarte* is a gregarious genus. If a species with such striking characteristics appeared there somebody would have been almost certain to recover it. But no specimen is known, nor what became of that one which served as the type from "Mr. Bland's" collection.

There is a shell which has been more than once obtained at Icy Cape which fulfills the requirements, and that is the species of *Venericardia* identified by Gray with "*Arcturus rudis*" (Humphrey Ms.) in 1839. The radial sulcation, except on the umbones (which our authors state were much eroded), is often obsolete, its beaks nearly anterior, its hinge broad, its margin with embrasure-like flutings, and it frequently has the disk tinged inside with a flush of livid purple-brown. I have in my Synopsis of the *Carditacea* called this *Venericardia rudis*, but I am now almost convinced that it is the present shell and should take the name of *V. crassidens.* It has the very markedly broad hinge and large, more or less sulcate cardinals called for by the description, and one of the specimens in the National Museum comes within 2 millimeters of the required dimensions. Mr. Smith has referred this to *Astarte castanea*, but *A. castanea* does not occur in that region, and has quite small though very distinct crenations, which have not the square form recalling embrasures like those of *Venericardia.* Nor does *A. castanea*, as far as known, reach a size comparable with that mentioned for *A. crassidens.* All the other Astartes known from the region where Icy Cape is situated which are large enough to fill the requirements of the diagnosis of Broderip and Sowerby have very white shells and perfectly smooth margins. There is only one crenate species there, and it is quite small in comparison and has quite minute crenulations.

The European species which do not appear in the Western Hemisphere are *Astarte sulcata* Da Costa, *A. incrassata* Brocchi (frequently called *A. fusca* Poli), *A. crebricostata* Forbes, *A. compressa* Montagu, *A. pusilla* Forbes, *A. parva* Searles Wood, *A.* (*Gonilia*) *calligona* Dall (*A. bipartita* Philippi non Sowerby), *A.* (*Digitaria*) *digitaria* Linnæus, *Goodallia triangularis* Montagu, and *G. macandrewi* Smith. *Astarte triquetra* Conrad is a *Parastarte* and belongs in the *Veneridæ; A. flabella* Conrad, is a *Venericardia*, and *A. fluctuata* Carpenter, is the nepionic young of *Crassatellites* sp.

Since the figures of the new species do not wholly fill the plates, the figures of some recently described but yet unfigured species are included with those of the Astartidæ, with references to the place of publication.

EXPLANATION OF PLATES.

Plate LXII.

Fig. 1. *Crania patagonica* Dall, upper valve, diameter 8.5 mm.; Proc. U. S. Nat. Museum, XXIV, 1902, p. 562; Straits of Magellan, U. S. N. M., No. 96913.

2. *Crassatellites brasiliensis* Dall, from off Rio de Janeiro in 59 fathoms; lon. 37 mm.; U. S. N. M., No. 96104; The Nautilas, XVI, p. 101, 1903.

3. *Crania patagonica* Dall, inner face of upper valve showing muscular impressions.

4. *Crenella megas* Dall, height 25 mm.; Proc. U. S. Nat. Mus., XXIV, 1902, p. 559; Panama Bay, in 33 fathoms; U. S. N. M., No. 96256.

5. *Echinochama californica* Dall, new species, from off Cerros Island, Lower California, in 25 fathoms; length exclusive of the spines, 40 mm.; U. S. N. M., No. 96452. The coloration is yellowish white.

Fig. 6. *Venericardia armilla* Dall, length, 8 mm.; from the Gulf of Mexico; U. S. N. M., No. 93374; Proc. Acad. Nat. Sci. of Philadelphia for 1902, p. 713.

7. *Astarte subæquilatera* Sowerby, var. *whiteavesii* Dall, umbonal view; length, 15 mm.; Gaspé, Gulf of St. Lawrence in 200 fathoms; U. S. N. M., No. 95748; p. 948.

8. *Limopsis panamensis* Dall, length, 6 mm.; Gulf of Panama in 1,030 fathoms; U. S. N. M., No. 109028; Proc. U. S. Nat. Mus., XXIV, 1902, p. 559.

9. *Astarte liogona* Dall, length 7.75 mm.; Gulf of Mexico; U. S. N. M., No. 64439; p. 948.

10. *Venericardia moniliata* Dall, length, 6.5 mm.; off Rio de Janeiro in 59 fathoms; U. S. N. M., No. 96132; Proc. Acad. Nat. Sci. of Philadelphia, for 1902; p. 713.

11. *Astarte soror* Dall; length, 19 mm.; Greenland; U. S. N. M., No. 109278; p. 947.

12. *Astarte subæquilatera* Sowerby, var. *whiteavesii* Dall; lateral view, length, 15 mm.; U. S. N. M., No. 95748; p. 948.

13. *Cetoconcha scapha* Dall, length, 13 mm.; Gulf of Panama in 100 fathoms; U. S. N. M., No. 109026; Proc. U. S. Nat. Mus., XXIV, p. 561, 1902.

PLATE LXIII.

Fig. 1. *Astarte vernicosa* Dall, length 17.5 mm.; Icy Cape, Polar Sea; U.S.N.M., No. 109276; p. 948.

2. *Astarte alaskensis* Dall, length 29 mm.; Bering Sea; U.S.N.M., No. 107274; p. 946.

3. *Venericardia gouldii* Dall, length 17 mm.; off San Diego in 823 fathoms; U.S.N.M., No. 109270; Proc. Acad. Nat. Sci. Philadelphia for 1902, p. 714.

4. *Venericardia incisa* Dall, length 9.5 mm.; Unalaska; U.S.N.M., No. 109267; Proc. Acad. Nat. Sci. of Philadelphia for 1902, p. 714.

5. *Astarte polaris* Dall, length 28 mm.; Bering Sea; U.S.N.M., No. 106859; p. 945.

6. *Astarte bennettii* Dall, length 15 mm.; Bering Sea; U.S.N.M., No. 109279; p. 946.

7. *Venericardia alaskana* Dall, length 36 mm.; Nunivak Island, Bering Sea. U.S.N.M., No. 109271; Proc. Acad. Nat. Sci. Philadelphia for 1902, p. 710;

8. *Astarte compacta* Carpenter, length 13.5 mm.; Puget Sound; U.S.N.M., No. 129118; Proc. Acad. Nat. Sci. Philadelphia for 1865, p. 57.

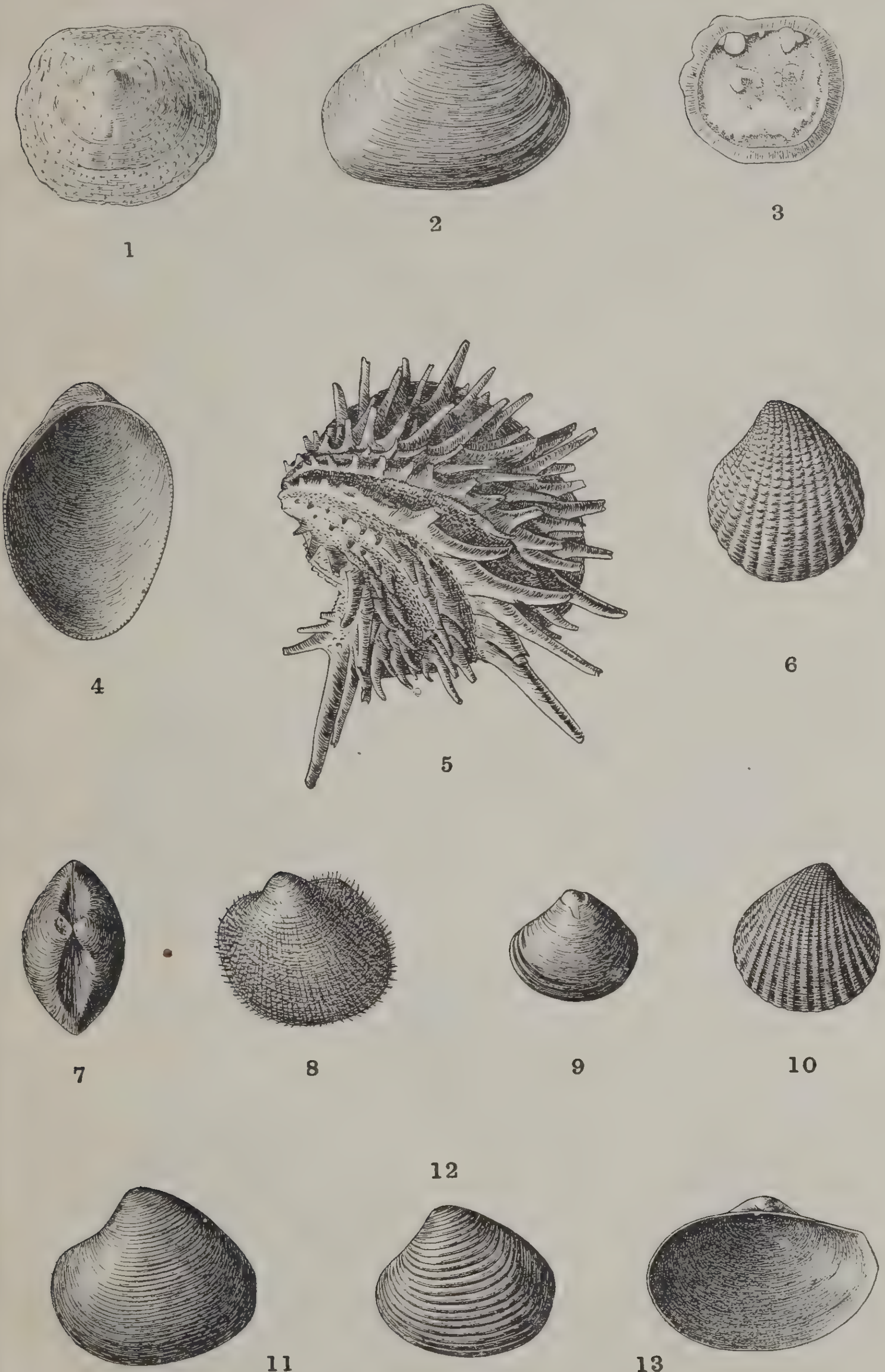
9. *Venericardia crassidens* Broderip and Sowerby (*V. rudis* Gray), length 31 mm.; Kyska Island, Aleutian chain; U.S.N.M., No. 109273; p. 949.

10. *Venericardia ventricosa* Gould, interior of right valve; length 18.5 mm.; California; Proc. Acad. Nat. Sci. Phila., for 1902, p. 709.

11. *Astarte* (*Rictocyma*) *esquimalti* Baird, length 15 mm., showing peculiar sculpture; from off Alaska Peninsula; U.S.N.M., No. 106862; p. 949.

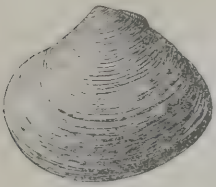
12. Another valve of the same species; p. 949.

Note.—In the synopsis of the Carditacea, in Proc. Acad. Nat. Sciences of Philadelphia for 1902, p. 700, the name *Miodon* Carpenter, 1864, was adopted for a subgenus of *Veneri cardia.* It appears that this name was used by Dumeril for a fish before it was proposed by Carpenter for the mollusk, and I have therefore proposed for Carpenter's *Miodon* the new name *Miodontiscus.* For the section of *Ferebra*, commonly called *Acus*, also a preoccupied name, I now suggest the designation of *Oxymeris.*



AMERICAN PELECYPODA.

FOR EXPLANATION OF PLATE SEE PAGES 950, 951.



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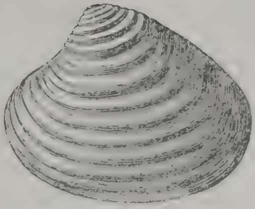

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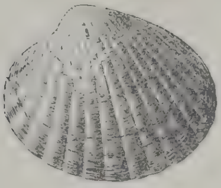

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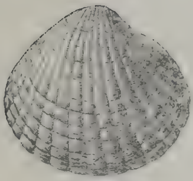

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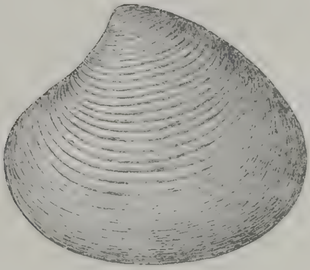

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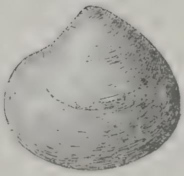

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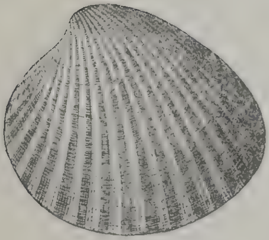

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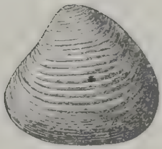

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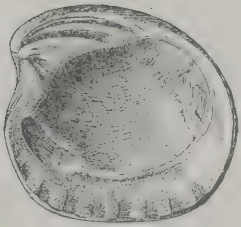

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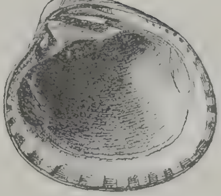

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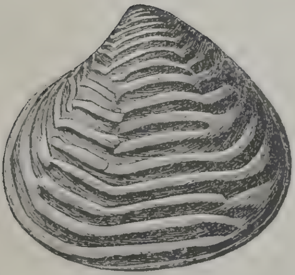

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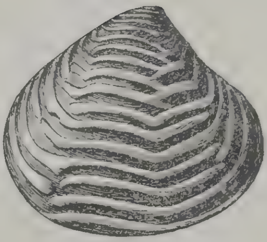

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Astarte and Venericardia.

For explanation of plate see page 953.

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SYNOPSIS OF THE FAMILY CARDIIDÆ AND OF THE NORTH AMERICAN SPECIES.

BY

WILLIAM HEALEY DALL,
Honorary Curator, Division of Mollusks.

From the Proceedings of the United States National Museum, Vol. XXIII, pages 381-392.

[No. 1214.]

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In pursuance of the plan already carried out for the Mactracea, Diplodontidæ, Leptonacea, Psammobiidæ, Solenidæ, and Tellinidæ, I have prepared the following synopsis of the *Cardiidæ*, to include the species found on both coasts of North America, as well as the subdivisions of the family considered as a whole. I should perhaps explain, for the benefit of students who have not followed recent systematic changes, that this family is here regarded as not including the curious brackish-water forms associated with *Adacna* in the waters of the Caspian and the Tertiary horizons of southeastern Europe. These forms were separated as a distinct family, *Limnocardiidæ*, by Stoliczka in 1870.

The forms included in the present paper have the hinge teeth arched (Cyclodont), springing from below the hinge margin, with the hinge plate obscure or undeveloped, and in many cases the two cardinal teeth in one of the valves rotated so that one stands above the other, while in the opposite valve one precedes the other horizontally, so that the axes of the two pairs when the shell is closed cross each other nearly at right angles. There is a small and a large cardinal in each valve; when the shell is closed the two small cardinals are external to the large ones. The laterals are present in all except *Lophocardium*. The sculpture of the shell is chiefly radial, the lobes of the mantle free below the siphons, the foot geniculate, elongated, and rounded, except in *Serripes*, which has it compressed and serrate below. The gills have a very simple type of reticulation, strongly plicate; the anal chamber in some cases is separated from the pedal by a siphonal septum. The ligament and resilium are parivincular, external and posterior. The valves have serrate margins and frequently gape behind.

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SYNOPSIS OF THE FAMILY CARDIIDÆ.

Genus CARDIUM (Linnæus) Lamarck.

(Syn. *Cardium* Linnæus, 1758, part; +*Cerastes* and *Cerastoderma* Poli, 1795; +*Acanthocardia* Gray, 1851; +*Acanthocardium* Roemer, 1869; +*Eucardium* Fischer, 1887; +*Criocardium* Conrad, 1870; +*Cardea* [Conrad, MS.] Whitfield, 1885; +*Plagiocardium* Cossmann, 1887; +*Papillicardium*, Sacco, 1899.)

Subgenus **Cardium** s. s. Type *Cardium aculeatum* Linnæus.

Subgenus **Trachycardium** Mörch. (Syn. *Trachycardium* Mörch, 1853; +*Granocardium* Gabb, 1868.) Type, *Cardium isocardia* Linnæus.

Section *Acrosterigma* Dall, 1900. Shell with an elevated mesial rib internally, radiating from the umbonal cavity. Type, *Cardium dalli* Heilprin; Pliocene of Florida.

Subgenus **Ringicardium** Fischer. (Syn. *Ringicardium* Fischer, 1887; + *Bucardium* Gray, 1853, *ex parte*, not of Megerle, 1811; *Pectunculus* (Adanson) Mörch, 1853; not of Lamarck, 1799.) Type, *Cardium ringens* Gmelin.

Subgenus **Cerastoderma** Mörch. (Syn. *Cerastoderma* Mörch, 1853; + *Cardium* s. s. Gray, 1851, not of Lamarck, 1799; + *Parvicardium* Monterosato, 1884.) Type, *Cardium edule* Linnæus.

Section *Dinocardium* Dall, 1900. Type, *Cardium magnum* Born.

Subgenus **Ethmocardium** White, 1880. Type, *Cardium whitei* Dall, = *Cardium speciosum* Meek and Hayden, 1857, not *Cardium speciosum* Adams and Reeve, 1850; Cretaceous.

Subgenus **Tropidocardium** Roemer. (Syn. *Tropidocardium* Roemer, 1868; + *Cardium* s. s. of many authors, not of Lamarck, 1799.) Type, *Cardium costatum* Linnæus.

Subgenus **Fragum** Bolten. (Syn. *Fragum* Bolten, 1798; + *Isocardia* Oken, 1815, not of Lamarck, 1799; + *Hemicardium* Swainson, 1840; + *Bucardium* Gray, 1853; + *Loxocardium* Cossmann, 1887.)

Section *Fragum* s. s. Type, *Cardium unedo* Linnæus.

Section *Hemicardium* (Cuvier) Dall, 1900. Type, *Cardium hemicardium* Linnæus.

Section *Trigoniocardia* Dall, 1900. Type, *Cardium graniferum* Sowerby.

Section *Ctenocardia* H. and A. Adams, 1857. Type, *Cardium hystrix* Reeve.

Subgenus **Papyridea** Swainson (Syn. *Papyridea* Swainson, 1840.) Type, *Cardium spinosum* Meuschen.

Section *Fulvia* Gray. (Syn. *Fulvia* Gray, 1853, not *Fulvia* H. and A. Adams, 1858; Fischer, 1887, etc.) Type, *Cardium apertum* Bruguière.

Subgenus **Lævicardium** Swainson. (Syn. *Lævicardium* Swainson, 1840; + *Liocardium* Mörch, 1853.) Type, *Cardium norvegicum* Spengler.

Section *Pachycardium* Conrad, 1870. Type, *Cardium spillmani* Conrad; Cretaceous.

Subgenus **Discors** Deshayes. (Syn. *Discors* Deshayes, 1858; + *Lyrocardium* Meek, 1876; + *Amphicardium* von Martens, 1880; + *Divaricardium* Dollfus and Dautzenberg, 1886.) Type, *Cardium subdiscors* d'Orbigny.

Genus SERRIPES Beck.

(Syn. *Serripes* (Beck) Gould, 1841; + *Aphrodite* Lea, 1834, not Hübner, 1816; + *Acardo* Swainson, 1840, not of Lamarck, 1799.) Type, *Cardium grönlandicum* Gmelin.

Genus CORCULUM Bolten.

(Syn. *Corculum* Bolten, 1798; + *Cardissa* Megerle, 1811; + *Isocardia* Oken, 1815, not of Lamarck, 1799; + *Les Hemicardes* Cuvier, 1817, *ex parte;* + *Hemicardium* Ferussac, 1822; + *Hemicardia* Mörch, 1853.) Type, *Cardium cardissa* Linnæus.

Genus LUNULICARDIA Gray.

(Syn. *Lunulicardia* Gray, 1853; + *Opisocardium* Bayle, 1879.) Type, *Cardium retusum* Linnæus.

Genus AVICULARIUM Gray.

(Syn. *Avicularium* Gray, 1853; + *Lithocardium* Woodward, 1854.)

Section *Avicularium* s. s. Type, *Cardium aviculare* Lamarck.

Section *Byssocardium* Munier Chalmas, 1882. Type, *Cardium emarginatum* Deshayes.

(*Pterocardia* Bayan, 1874, and *Goniocardium* Vasseur, 1880, are suspiciously close to *Avicularium*.)

Genus PROTOCARDIA Beyrich.

(Syn. *Protocardia* Beyrich, 1845; + *Protocardium* Meek and Hayden, 1860; + *Nemocardium* Meek, 1876.)

Section *Protocardia* s. s. Type, *Cardium hillanum* Sowerby.

Section *Nemocardium* Meek. Type, *Cardium semiasperum* Deshayes.

Section *Leptocardia* Meek, 1876. Type, *Cardium subquadratum.*

Evans and Shumard; Cretaceous.

Subgenus **Lophocardium** Fischer, 1887. Type, *Cardium cumingi* Broderip.

? Genus HEMIDONAX Mörch.

(Syn. *Hemidonax* Mörch, 1870; + *Donacicardium* Vest, 1876; + *Donaciocardium* von Martens, 1876.) Type, *Cardium donaciforme* Schroeter.

This group probably belongs with the Donacidæ.

EAST AMERICAN SPECIES.

Cardium (Trachycardium) isocardia Linnæus, 1758.

Range: Cape Hatteras, North Carolina, to Trinidad Island, West Indies. Pliocene to Recent.

This includes *Cardium egmontianum* Shuttleworth, 1856, and *Cardium eburniferum* Guppy, 1875.

Cardium (Trachycardium) muricatum Linnæus, 1758.

Range: North Carolina to Santa Caterina, Brazil. Pleistocene.

This is *Cardium muricatum* Linnæus, No. 69, not No. 62, 1758; + *Cardium campechiense* Bolten, 1798; + *Cardium gossei* Deshayes, 1854.

Cardium (Trachycardium) leucostoma Born, 1780.

Range: West Indies.

This includes *Cardium marmoreum* Lamarck, 1819; + *Cardium elongatum* Wood, 1815, and Sowerby, 1831, not Bruguière, 1789; + *Cardium magnum* Wood, 1825. I am inclined to think this shell may be the original *Cardium magnum* Linnæus.

Cardium (Trachycardium) subelongatum Sowerby, 1840.

Range: Southern West Indies.

This is not the *Cardium angulatum* Lamarck as assumed by some authors.

Cardium (Cerastoderma) ciliatum O. Fabricius, 1780.

Range: Arctic and boreal seas south to Cape Cod on the Atlantic and to Puget Sound on the Pacific side.

This is *Cardium islandicum* Chemnitz, 1782; + *Cardium edule* Mohr, 1786, not of Linnæus; + *Cardium pubescens* Couthouy, 1838; + *Cardium arcticum* Sowerby, 1840; + *Cardium dawsoni* Stimpson, 1862; + *Cardium hayesii* Stimpson, 1863; + *Cardium boreale* Broderip and Sowerby, 1829, not of Reeve, 1844. The small compact specimens which have lost their pubescence form Stimpson's *Cardium hayesii*.

Cardium (Cerastoderma) elegantulum Beck, 1842.

Range: Greenland, 90 fathoms.

This is described from Beck's manuscript in Möller's Index Moll. Grönl., 1842.

Cardium (Cerastoderma) pinnulatum Conrad, 1831.

Range: Labrador to Cape Lookout, North Carolina, in 1 to 266 fathoms. Also Pleistocene of New Brunswick.

Cardium (Dinocardium) robustum Solander, 1786.

Range: Cape May, New Jersey, south to Belize and Jamaica, West Indies. Upper Miocene to Recent.

This is best known under the name of *Cardium magnum* Born, 1780, but it is not the *Cardium magnum* of Linnæus, 1758; it is *Cardium ventricosum* Bruguière, 1789; *Cardium maculatum* Gmelin, 1792; + *Cardium carolinense* Conrad, 1862, not of Conrad, 1875.

Cardium (Fragum) medium Linnæus, 1758.

Range: Cape Lookout, North Carolina, south to Santa Marta, Brazil. Upper Miocene to Recent.

This includes *Cardium venustum* Dunker, 1861, and *Cardium columba* Heilprin, 1886; but not *Cardium magnificum* Deshayes, as stated by Carpenter.

Cardium (Trigoniocardia) antillarum Orbigny, 1845.

Range: Straits of Florida to Guadeloupe Island, West Indies, in 2 to 182 fathoms.

This includes *Cardium ceramidum* Dall, 1886.

Cardium (Papyridea) spinosum Meuschen, 1787.

Range: Cape Hatteras, North Carolina, south to Santa Marta, Brazil. Pleistocene.

This includes *Cardium hiatus* Meuschen, 1787; + *Cardium bullatum* Chemnitz (Solen), 1782, not of Linnæus, 1758; + *Cardium bullatum* of many authors but not of Linnæus; + *Cardium soleniforme* Bruguière, 1789; ?+ *Cardium latum* Born, 1780, not *Cardium latum* "Born" Reeve, 1844; + *Cardium hiulcum* Reeve (monstr.), 1844.

Curiously the Pliocene form of Florida is identical, not with the existing type of the Antilles, but with that of the southeast Atlantic, St. Helena, and the Cape Verde Islands, a variety with the angle of the ribs minutely crenulate, which I have named *Cardium spinosum* var. *turtoni*. The Pacific species is hardly more than varietally different from the West Indian form, and will retain Sowerby's name of *aspersum* in a varietal sense.

Cardium (Papyridea) semisulcatum Gray, 1825.

Range: Southern Florida, south through the West Indies to Trinidad and the Cape of Good Hope, in 3 to 300 fathoms. Pliocene to Recent.

This is *Cardium ringiculum* Sowerby, 1840; + *Cardium petitianum* Orbigny, 1845.

Cardium (Lævicardium) serratum Linnæus, 1758.

Range: Cape Hatteras, North Carolina, south to Guadeloupe, West Indies, in 1 to 75 fathoms. Oligocene to Recent.

This is not *Cardium serratum* Pennant, 1778; but is the *Cardium lævigatum* of Born, 1780; and of Lamarck, 1819; the *Cardium citrinum* of Wood, 1815; the *Cardium pictum* Ravenel, 1861 (*testa juv.*). but not of Dunker, 1861; the *Cardium lineatum* of Krebs, 1864, but not of Gmelin, 1792; the *Cardium pristis* Valenciennes, 1846; probably the *Cardium oviputamen* Reeve, 1844; the *Cardium venustum* of Gabb, 1873, but not of Dunker, 1861; the *Cardium lævigatum* Reeve, 1844, but not of Linnæus, 1758; and the *Cardium glabratum* of Roemer, 1869.

Cardium serratum var. **brasilianum** Lamarck, 1819.

Range: Southern West Indies south along the coast of Brazil.

This is the *Cardium lamarckii* Orbigny, 1847, but not the *Cardium brasiliense* of Gmelin, 1792, which was founded on the figure of an *Arca*.

Cardium serratum var. sybariticum Dall, 1886.

Range: West Indies (Barbados, etc.), in 100 fathoms or more. Oligocene to Recent.

This is a deep-water dwarf form of *serratum.* It may include *Cardium pictum* Ravenel, but certainty can not be attained on account of the loss of Ravenel's types.

Cardium (Lævicardium) mortoni Conrad, 1830.

Range: Nova Scotia to Santa Marta, Brazil, in 1 to 5 fathoms. Miocene to Recent.

Serripes gronlandicus Gmelin, 1792.

Range: Arctic and boreal seas, south to Cape Cod on the Atlantic and Puget Sound on the Pacific side, in 2 to 60 fathoms. Pleistocene.

This is the *Mactra radiata* of Donovan, 1799; the *Cardium edentulum* of Montagu, 1808; *Aphrodite columba* Lea, 1834; *Cardium boreale* Reeve, 1844, not of Broderip and Sowerby, 1829; and *Cardium fabricii* Deshayes, 1854.

Protocardia peramabilis Dall, 1886.

Range: Rhode Island southward in deep water to Grenada, West Indies, 18 to 164 fathoms.

Protocardia tincta Dall, 1886.

Range: Key West, Barbados, Santa Cruz, and Porto Rico, in 7 to 100 fathoms.

This was described as a variety of the preceding, which is a white or yellowish shell, but the receipt of more specimens shows them to be quite distinct.

NOTES.

Cardium haitense Guppy, as of Sowerby, 1877, said to be dredged alive in the Gulf of Paria, is probably *Cardium antillarum* Orbigny or a related species.

Cardium pictum Dunker, 1861 (April, not *Cardium pictum* Ravenel, February, 1861), is probably a variety of *Cardium papillosum* Poli, from south Europe, with a wrong locality label. It was a dealer's shell.

Cardium pectinatum (Linnæus) Menke, cited from St. Vincent, is from the island of that name in the Cape Verde group, not the Antillean St. Vincent.

Cardium cygnorum Deshayes, cited by J. Matthew Jones from Bermuda, is probably a misidentification, as Deshayes's species came from Swan River, Australia, and if found on Bermuda must have been adventitious.

Cardium echinatum O. Fabricius, 1780, from Greenland was doubtless derived from European ballast.

Cardium fasciatum Montagu, of Wheatley, 1842, from South Carolina, and De Kay, 1843, has not been authenticated as occurring on the American coast, though it occurs in Iceland.

WEST AMERICAN SPECIES.

Cardium (Trachycardium) quadragenarium Conrad, 1837.

Range: Santa Barbara, California, to Todos Santos Bay, Lower California, in 24 to 60 fathoms.

This is *Cardium luteolabrum* Gould, 1851; + *Cardium xanthocheilum* (Gould MS.) Carpenter, 1856; + *Cardium arenatum* Carpenter (*testa juv.*), 1857; + *Cardium setosum* Tryon, 1872, not Redfield, 1846.

Shells from deep water are remarkably fine and among the largest of the genus. The number of ribs ranges from 42 to 44 and in a remarkable oval variety, much more oblique than the typical form, to 46. It may be noted that nearly all Cardia have an oval and a more rotund variety, possibly to be correlated with sex.

Cardium (Trachycardium) consors Sowerby, 1833.

Range: Gulf of California south to the Galapagos Islands.

A fine and well-known shell. A variety *laxum* Dall has the imbrications twice as distant as usual and more elongated. The specimens seen were from the Gulf of California and were all of a color decidedly lighter than the type. The ribs vary from 31 to 34.

Cardium (Trachycardium) maculosum Wood, 1815.

Range: Panamic region; St. Elena, Colombia.

This is *Cardium multistriatum* Sowerby, 1833, and perhaps also *Cardium arenicolum* Reeve, 1845.

Cardium (Trachycardium) pristipleura Dall, 1900.

Range: Gulf of California (La Paz) and west coast of Middle America.

This is *Cardium maculosum* Sowerby, 1833, not Wood, 1815; + *Cardium maculatum* Reeve, 1844, not Gmelin, 1792. The shell has 34 to 39 ribs, laterally imbricate. *Cardium lacunosum* Reeve, 1845, should be compared with it.

Cardium (Trachycardium) senticosum Sowerby, 1833.

Range: Gulf of California to Payta, Peru.

This is *Cardium muricatum* Menke, not Linnæus; + *Cardium rastrum* Reeve, 1844; +(?) *Cardium lima* Reeve, 1845; + *Cardium lucinoides* Carpenter (*testa juv.*), 1857. It is the Pacific coast analogue of *Cardium muricatum* Linnæus.

Cardium (Trachycardium) belcheri Sowerby, 1829.

Range: Gulf of California, in 6 to 24 fathoms.

Cardium (Ringicardium) procerum Sowerby, 1833.

Range: Lower California, from the vicinity of Cerros Island south to Ecuador, and Payta, Peru. Pleistocene of upper California.

This is *Cardium laticostatum* Sowerby, 1833, and *Cardium panamense* Sowerby, 1833; + *Cardium subelongatum* Valenciennes, 1846, not of Sowerby, 1840; + *Cardium rotundatum* Carpenter (*testa juv.*), 1857.

There are 7 ribs on the posterior area while the rest of the shell has from 13 to 18.

Cardium (Cerastoderma) corbis Martyn, 1784.

Range: Pribilof Islands, Bering Sea, and the Aleutian chain, and southward to San Diego, California, and Hakodadi, Japan.

This is *Cardium nuttallii* Conrad, 1838; + *Cardium californianum* Conrad (*testa juv.*), 1838; + *Cardium nuttallianum* Carpenter, 1864.

This fine shell normally has thickened loops thrown upward over the backs of the ribs as its proper sculpture, but in some young shells the bight of the loops becomes obsolete, giving an ornament nearly of the type of some species of *Trachycardium.*

Cardium (Cerastoderma) californiense Deshayes, 1839.

Range: Bering Strait southward to Oregon, and Monterey, California, and to Hakodadi, Japan.

This is *Cardium pseudofossile* Reeve, 1844, and *Cardium blandum* Gould (*testa juv.*), 1850.

A variety *comoxense* Dall occurs in the bowlder clay of Vancouver Island with the ribs depressed and flattened to such an extent as to be defined only by the interstitial lines.

Cardium (Cerastoderma) ciliatum O. Fabricius, 1780.

Range: Arctic and boreal seas, southward to Puget Sound and Japan.

For synonymy see under the head of this species in the East American list. The same varieties occur on both coasts.

Cardium (Cerastoderma) decoratum Grewingk, 1850.

Range: Bowlder clays of Alaska and British Columbia.

This species may very likely be found alive hereafter.

Cardium (Fragum) magnificum (Deshayes MS.) in Carpenter, 1857.

Range: Lower California south to Payta, Peru, in 10 to 13 fathoms.

This is *Cardium planicostatum* Sowerby, 1833, not of Sedgwick and Murchison, 1829. Carpenter wrongly refers Deshayes's name to *Cardium medium* as a synonym, but the species is amply distinct from *Cardium medium* and represents it on the Pacific coast.

Cardium (Fragum) biangulatum Sowerby, 1829.

Range: Catalina Island, California, south to Panama.

Cardium (Trigoniocardia) graniferum Broderip and Sowerby, 1829.

Range: Gulf of California to Panama.

Cardium (Trigoniocardia) alabastrum Carpenter, 1857.

Range: Gulf of California, 8 to 24 fathoms; Mazatlan.

Cardium (Trigoniocardia) ovuloide Reeve, 1845.

Range: West coast of middle America?

Cardium (Trigoniocardia) obovale Sowerby, 1833.

Range: Margarita Bay, Lower California, to Ecuador.

Cardium (Papyridea) spinosum Meuschen, 1787, variety **aspersum** Sowerby, 1833.

Range: Margarita Bay, Lower California, and the Gulf of California, south to Panama.

This is cited as *Cardium* "*asperum*" Sowerby by Roemer, 1869. For the synonymy of the species see the East American list.

Cardium (Lævicardium) elatum Sowerby, 1833.

Range: San Pedro, California, and south to Panama. Pleistocene of California.

This is the largest species of the genus. One valve in the United States National Museum measures 170 mm. in height and 143 mm. in length.

Cardium (Lævicardium) substriatum Conrad, 1838.

Range: From Catalina Island and San Pedro, California, south to San Ignacio lagoon, Lower California. Pleistocene of California.

This is *Cardium cruentatum* Gould, 1856.

Cardium (Lævicardium) elenense Sowerby, 1840.

Range: Gulf of California, south to Panama; Clarion Island.

This is *Cardium apicinum* Carpenter, 1864, as Carpenter himself suspected.

Serripes grönlandicus Gmelin, 1792.

Range: Arctic seas, south to Puget Sound and Hakodadi. Pleistocene.

The synonymy is cited in the East American list.

Serripes laperousei Deshayes, 1839.

Range: Bering Strait, at Plover Bay, south to Avatcha Bay, Kamchatka, and Sitka, Alaska.

This is a well-defined species and the specific characters can be recognized in shells less than an inch long.

Protocardia centifilosa Carpenter, 1864.

Range: Queen Charlotte Islands, British Columbia, south to San Diego, California.

Protocardia centifilosa var. **richardsonii**, Whiteaves, 1878.

Range: Queen Charlotte Islands, British Columbia, south to the coast of Oregon.

This is *Fulvia modesta* Adams and Reeve, var. *centifilosa* Carpenter. The *Protocardia modesta* appears to me distinct from the American shell and is a native of Japan. The northern specimens forming the variety are a little stronger and coarser than those from California, with which they seem to be united by intermediate gradations, though the extremes have apparently good distinctions.

Protocardia (Lophocardium) cumingii Sowerby, 1833.

Range: Gulf of Dulce, Central America, 12 fathoms.

Protocardia (Lophocardium) annettæ Dall, 1889.

Range: Gulf of California, 6 to 24 fathoms.

This is distinguished from the preceding species by its greater altitude and lower radial keel.

NOTES.

Cardium aculeatum Linnæus was found, a single worn valve, by Dr. John S. Newberry at Acapulco. It was doubtless a ballast specimen.

Cardium triangulatum "Sowerby" Carpenter, 1857, I have not been able to discover in the literature. It is perhaps a manuscript name taken from a museum tablet.

Cardium gemmatum Gould, in Carpenter, Rep. British Association, 1857, p. 229, appears to be merely a "list name" and does not appear in Gould's works.

Cardium orbita Sowerby, 1833, appears to be an Indo-Pacific and not an American species.

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SYNOPSIS OF THE SOLENIDÆ OF NORTH AMERICA AND THE ANTILLES.

BY

WILLIAM H. DALL,
Curator, Division of Mollusks.

From the Proceedings of the United States National Museum, Vol. XXII, pages 107-112.

[No. 1185.]

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In revising the group for the purpose of monographing the fossil species so many changes in nomenclature and distribution were found to be involved that it was thought the following summary would prove useful to students of the recent forms:

EAST AMERICAN SPECIES.

Genus SOLEN (Linnæus, 1758) Scopoli, 1777.

(*Vagina* Megerle, 1811; + *Hypogæa* and *Hypogæoderma* Poli, 1791–1795; + *Listera*, Leach manuscript, Gray, 1852.) Type, *Solen marginatus* Pulteney.

1. *Solen viridis* Say, 1822; Rhode Island (Totten) to Georgia (Postell).

Section SOLENA Mörch, 1852.

(*Solena* sp. Browne, nonbinomial, 1756; + *Hypogella* Gray, 1854.) Type, *S. obliqua* Spengler = *S. ambiguus* Lamarck.

2. *Solen* (*Solena*) *obliqua* Spengler, 1793; Cuba, Porto Rico, St. Thomas.

S. rudis Sowerby, 1874, not C. B. Adams, 1852; + *philippinarum* Sowerby, 1874, not Hanley, 1843, are synonymous.

Genus ENSIS Schumacher, 1817.

(*Ensatella* Swainson, 1840, + *Solen* Leach, 1852.) Type, *Ensis magnus* Schumacher.

1. *Ensis directus* Conrad, 1843; Labrador to Indian Key, Florida. Pliocene to recent.

E. "*americana* Beck" of H. and A. Adams, 1856, is probably a manuscript name. *Solen siliqua* Chickering, 1855, not Linnæus, 1758, is a synonym. This species was generally confounded with *Solen magnus* of Schumacher, under the name of *Solen ensis* Linnæus, by the earlier American authors.

2. *Ensis minor* Dall; Cape May to Florida and Texas.

This is *Solon ensis* var. *minor* of some of the earlier writers, and bears to *E. directus* the same relation that *Ensis ensis* Linnæus of Europe does to the north European *E. magnus* Schumacher. It differs from the young of *E. directus* in having the valves wider behind than in front and relatively narrower as a whole.

Genus SILIQUA Megerle, 1811.

(*Leguminaria* Schumacher, 1817; + *solecurtus* A Blainville, 1825; + *Aulus* Oken, 1835, not Oken 1815; + *Solecurtoides* Desmoulins, 1832; + *Solenocurtus* Sowerby, 1839; + *Machæra* Gould, 1841.) Type, *Solen radiatus* Linnæus.

1. *Siliqua squama* Blainville, 1824; Grand Banks of Newfoundland and Gulf of St. Lawrence.

This is *Machæra nitida* Gould, 1841, and *Cultellus medius* Sowerby (not Gray), Conch. Icon., 1874.

2. *Siliqua costata* Say, 1822; Gulf of St. Lawrence south to Cape Hatteras, North Carolina, in suitable localities.

The following are synonymous names: *Solecurtoides nahantensis* Desmoulins, 1832; *S. sayi* Gray, 1833; *S. radiatus* Ravenel (not Linnæus), 1834; *Cultellus grayanus* Sowerby (not Dunker?), 1874; *Cultellus subsulcatus* Sowerby, 1874; *Cultellus belcheri* (as of Gray, manuscript) Sowerby, 1874; not *C. costatus* Middendorf, 1847, nor Sowerby, 1874.

Genus PSAMMOSOLEN Risso, 1826.

(= *Psammobia* Risso, 1826, err. typ.; + *Solecurtus* B, Blainville, 1825; + *Macha* Oken, 1835; + *Adasius* Leach, 1852; not *Macha* Philippi, 1853, nor *Psammosolen* Hupé, 1854.) Type, *Solen strigilatus* Linnæus.

1. *Psammosolen sanctæ-marthæ* (Chemnitz) Orbigny, 1853; North Carolina, Bermuda, the Antilles, and south to Rio Janeiro (Dunlap).

2. *Psammosolen cumingianus* Dunker, 1861; North Carolina, to Texas and São Paulo, Brazil.

WEST AMERICAN SPECIES.

Genus SOLEN (Linnæus) Scopoli.

1. *Solen sicarius* Gould, 1850; Vancouver Island to San Pedro, California; Japan, A. Adams (?).

2. *Solen rosaceus* Carpenter, 1863; Santa Barbara, California, south to the Gulf of California; La Paz.

3. *Solen mexicanus* Dall; west coast of Tehuantepec, Mexico.

4. *Solen* (*Solena*) *rudis* C. B. Adams, 1852; Panama.

Confounded with *S. obliquus* Spengler of the Antilles by Carpenter and Sowerby.

Genus ENSIS Schumacher.

1. *Ensis californicus* Dall; Monterey, California, south to the Gulf of California; La Paz.

Genus SILIQUA Megerle.

1. *Siliqua lucida* Conrad, 1838; Monterey to San Diego, California. Confounded with the young of *S. nuttallii* by Carpenter, 1863, and Gabb, 1868; also, according to Conrad, with *S. radiata* Linnæus.

2. *Siliqua media* Gray, 1839; Okhotsk and Bering seas and northward to the Arctic Ocean at Cape Lisburne.

Machæra costata Middendorf, 1851, not Say, 1822; + *S. borealis* Conrad, 1867, not *Cultellus medius* Sowerby, Conch. Icon., 1874, = *S. squama* Blainville.

3. *Siliqua patula* Dixon, 1788, Okhotsk Sea; the southern border of Bering Sea, and the Gulf of Alaska to Sitka.

Described from Cooks Inlet, Alaska. The following names are synonyms: *Solen maximus* Wood, 1815, not Gmelin, 1792; *S. gigas* Dillwyn, 1817; *S. grandis* (Hinds Manuscript as of Gmelin) Dunker, 1861, and Carpenter, 1863; *S. splendens* Chenu, 1845 and 1862. Large; with submedian beaks and straight rib. The following are discriminable varieties, but apparently connected by gradations with the typical *S. patula.*

4. *Siliqua* (*patula* var.) *alta* Broderip and Sowerby, 1829; Bering Sea and Strait.

This is figured under the name of *Cultellus costatus* by Sowerby, Conch. Icon., 1874, but is not the *costatus* of Say. It is short and broad with very anterior beaks and straight rib.

5. *Siliqua* (*patula* var.) *nuttallii* Conrad, 1838, Lituya Bay, Alaska, south to Oregon, and California as far as Monterey.

S. americana Chenu, 1845, may be the same, but I do not know it; *S. californica* Conrad, 1868, and *S. nuttali* Sowerby, 1874, are synonymous. The shell is very straight, brilliantly polished, narrower than the typical *S. patula* and with a much more oblique rib. The beaks are less anterior than in *S. alta.*

NOTES.

Solen tenuis Broderip and Sowerby, 1829, is unidentifiable, from the absence of a figure and the excessive brevity of the description. It is not the *S. tenuis* Gray, in Griffith's Cuvier, 1833. It was collected by Belcher, whose shells came mostly from northwest America.

Solen "*lineatus* Spengler," appears in Mörch's Catalogue of Poulsen's West India shells. It is probably intended for *S. linearis* Spengler (in Chemnitz) and may have been based on a misidentified specimen of *Ensis minor.*

Solen niveus Hanley is listed by Guppy in his Paria fauna, 1877, and was perhaps based on a young specimen of *S. obliquus* Spengler, or the following species:

Solen lappeanus Dunker, Moll. Marina, 1858, is said to be from the Antilles, but has not been reported from that region by anyone else. Externally it is not unlike *S. viridis* Say.

Aulus (=*Siliqua*) *rostratus* Dunker, 1861, figured by Sowerby, Conch. Icon., 1874, is said to be from the Arctic Ocean, but this is certainly erroneous. *Solen radiatus* Linnæus, appears in Pfeiffer's list of Cuban shells,[1] but the shell intended was very likely *Tagelus divisus* Spengler. No species of *Siliqua* is known from Cuba.

Krebs cites *Machæra lucida* "Gould," from Mörch's Yoldi catalogue, as Central American; but this is doubtless *M. lucida* of Conrad, from the Pacific coast of Central America.

There is no large species of *Ensis* on the west coast of America corresponding to the *E. magnus* and *E. directus* of the northern Atlantic, though the *E. californicus* is the exact analogue of the European *E. ensis* and the east American *E. minor*. Among the Siliquas on the two sides of the continent *S. alta* and *S. squama*, *S. media* and *S. costata*, are respectively analogous, while *S. lucida* finds its counterpart in the *S. pulchra* of Japan.

SOLEN MEXICANUS, new species.

Shell small, straight, parallel-sided, with anterior beaks, the anterior end obliquely truncate; the posterior end squarely truncate with the corners slightly rounded off; hinge with the teeth normal, the ligament unusually long in a very narrow groove; shell white, covered with a polished olivaceous epidermis, longitudinally striate near the ventral edges of the valves. Length of shell, 60 mm.; of ligament, 11 mm.; width of valves, 8.5 mm.; diameter, 5.5 mm.

Type.—No. 120634, U.S.N.M. Specimen from the Gulf of Tehuantepec.

This species recalls the *Solen linearis* of Chemnitz, which, however, is considerably longer in proportion to its width.

ENSIS CALIFORNICUS, new species.

Shell small, slender, arcuate, the sides nearly parallel, the valves being slightly attenuated toward the ends, beaks anterior, the anterior truncation bluntly rounded, the posterior similar; color white with livid pink streaks concentrically disposed; epidermis olivaceous brilliantly polished; hinge with small and very delicate cardinals (usually broken off), one in the right and two in the left valve, the dorsal ridge comparatively strong and elevated, shorter than the ligament. Length of shell, 60 mm.; of dorsal tooth or ridge, 5.2 mm.; of ligament, 9 mm.; width of shell, 7 mm.; perpendicular to the chord of the arc formed by the dorsal margin of the valves, 2 mm.

Type.—No. 158891, U.S.N.M. Specimen from 14 fathoms sand, off the island of San Pedro Martir, Gulf of California. Some specimens reach a length of 85 mm.

This species recalls small specimens of the east American *E. minor*, which, however, differs by being wider distally than in front, larger when adult, with proportionately wider and more arcuate valves.

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[1] Archir für Naturgeschichte, 1840, p. 261.

In this connection I may add some supplementary data to my "Synopsis of the Psammobiidæ,"[1] which have come to hand since that article was printed.

Tagelus gibbus Spengler, as typically restricted, passes as far south as St. Thomas, West Indies, and probably to the northeast shores of Brazil. The variety called *T. platensis* by d'Orbigny differs by being shorter and more attenuated behind, and I have seen it only from the southern coast of Brazil and Uruguay. In all the typical species of *Tagelus* the posterior end is shorter than the anterior, the pallial sinus is deep, reaching to or forward of the perpendicular from the umbones, and the posterior adductor scar is rounded. The teeth are simple, erect, pedunculated, two in each valve. There is no central constriction or internal rib. Curiously enough, the shell figured by H. and A. Adams to illustrate *Tagelus* (or *Siliquaria*) *gibbus* is a *Novaculina*, while they describe the teeth as 3:2 (which is the dentition of *Novaculina*) and the sinus as deep beyond the umbones, which belongs to *Tagelus* and is untrue of *Novaculina*.

Owing to the fact that a number of externally similar but really different shells have been confused, the diagnoses of these groups are frequently inaccurate, and I have therefore reviewed the question in the light afforded by the specimens. The following are the characters:

Genus NOVACULINA Benson, 1830.

Type.—N. gangetica Benson.

Beaks subanterior; teeth (when fully developed) three in the left and two in the right valve; the anterior left tooth often obsolete or wanting, the anterior right tooth bifid; there is no median constriction, the pallial sinus is small, not reaching the beaks, the posterior adductor scar rounded; the scar of the ventral side of the sinus not coalescent with the pallial line below it; situs in fresh water.

Section CLUNACULUM Dall.

Type.—Solecurtus mollis (Gould) Sowerby, Conch. Icon. *Solecurtus*, 1874, pl. VI, fig. 26; coast of Brazil and Uruguay.

Valves obliquely constricted, the constriction reflected by an internal thickened elevation (not a clavicle); beaks subanterior; teeth, two in the left and two in the right valve, the posterior left tooth bifid, in some of the species there is an obsolete tooth behind it; the pallial sinus not reaching the beaks, the posterior adductor scar triangular, the scar of the sinus coalescent ventrally with the pallial line; situs marine.

Genus TAGELUS Gray, 1847.

Type.—Solen gibbus Spengler.

Valves not constricted and without a clavicle; beaks medium or subposterior: teeth simple, pedunculate, two in each valve; pallial sinus deep, reaching to or beyond the beaks, posterior adductor scar rounded, the scar of the sinus coalescent ventrally with the pallial line; situs estuarine or marine.

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[1] Proc. Acad. Nat. Sci. Phila., 1898, pp. 57-62.

Section MESOPLEURA Conrad, 1867.

Type.—Solen divisus Spengler.

Valves arcuate, not constricted, but with a more or less perfectly developed clavicular rib extending ventrally from the submedian beaks, otherwise as in *Tagelus.*

Gray in 1854 included species of *Clunaculum* under *Novaculina* as well as some species of true *Tagelus* like *T. dombuji.* I have not been able to examine all the described species, but *Solen constrictus* Lamarck, certainly, and probably *S. inequalis* and *S. complanatus* Sowerby, belong to *Clunaculum.*

TAGELUS POEYI, new species.

Shell resembling a young *T. gibbus*, but with more equal and evenly rounded ends, the beaks median, the teeth slender, long, but quite small, the nymphs for the ligament shorter and more central, the whole of the ventral side of the pallial sinus coalescent with the pallial line. Shell white, covered with a pale ashy gray, dehiscent epidermis; the anterior dorsal margin slightly decurrent. Length, 50 mm.; altitude, 18 mm.; diameter, 11.5 mm.

Types.—No. 27425, U.S.N.M., from Cuba (Poey); also from mouth of Old River, Belize (Stanton); beach at Greytown, Nicaragua (Dall); and Rio Grande do Sul, Brazil (Ihering).

This species can be instantly distinguished from *T. gibbus* by the different form of the pallial sinus and the different position of the beaks. It does not appear to attain more than half the size of the full grown *T. gibbus.*

Specimens of *T. gibbus* collected at Matagorda Bay, Texas, by Singley, of a light but distinct yellow color, are in the national collection, and more recently Hon. J. D. Mitchell has sent specimens, of which he has several in his collection, of a decided pink color, from the same vicinity. Both form a decided contrast to the white or slightly ferruginous tint of the average specimens of this species.

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SYNOPSIS OF THE FAMILY VENERIDÆ AND OF THE NORTH AMERICAN RECENT SPECIES.

BY

WILLIAM HEALEY DALL,
Honorary Curator, Division of Mollusks.

From the Proceedings of the United States National Museum, Vol. XXVI, pages 335-412
(with Plates XII-XVI).

[No. 1312.]

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This synopsis is one of a series of similar summaries of the families of bivalve mollusks which have been prepared by the writer in the course of a revision of our Pelecypod fauna in the light of the material accumulated in the collections of the United States National Museum. While the lists of species are made as complete as possible, for the coasts of the United States, the list of those ascribed to the Antilles, Central and South America, is probably subject to considerable additions when the fauna of these regions is better known and the literature more thoroughly sifted. No claim of completeness is therefore made for this portion of the work, except when so expressly stated. So many of the southern forms extend to the verge of our territory that it was thought well to include those known to exist in the vicinity when it could be done without too greatly increasing the labor involved in the known North American list.

The publications of authors included in the bibliography which follows are referred to by date in the text, but it may be said that the full explanation of changes made and decisions as to nomenclature arrived at is included in the memoir on the Tertiary fauna of Florida in course of publication by the Wagner Institute, of Philadelphia, for the writer, forming the third volume of their transactions. The rules of nomenclature cited in Part III of that work (pp. 561–565) are those upon which this revision has been founded, and are believed to express the opinions of the majority of those who have given thorough study to the subject of nomenclature. Authors who do not accept the British Association rules, as thus developed, can not expect to find their personal views reflected in this revision.

It may be thought that the subdivision of groups has been carried farther than desirable, to which the writer can only reply that in tracing the genealogy of our recent species through the Tertiary, from horizon to horizon, he has found the minor divisions of very great assistance, the more thorough scrutiny and study which they naturally require, and which is irksome to superficial students, being essential to really thorough work in paleontology, and no small help in handling the recent forms. On the other hand, those whose studies do not require this insistence on apparently minor characteristics do not need to use the sectional names, and may easily fall back on those names by which the larger groups are called.

The family Veneridæ represents the culmination of Pelecypod evolution, so far as this may be represented by any single family. In beauty of color and delicacy of color pattern, in multiplicity and variety of sculptural developments, in wide distribution and bathymetric range, the Veneridæ equal if they do not surpass any other Teleodont group. While the shells are often exquisitely beautiful, the coloration and appendages of the soft parts are also frequently similarly attractive, leading to wonder why parts which are always covered by the mud or sand or hidden between the valves should develop such beauties. The periostracum is usually thin and inconspicuous, but sometimes by color or quality of surface adds attractiveness to shells otherwise dull or colorless.

The geographical distribution of groups in the Veneridæ has some marked characteristics, which are especially brought out when the distribution is scrutinized by the minor groups, such as sections. Omitting fossils, which in the main agree very closely with the recent species in distribution, *Sunetta* and the whole group covered by *Gafrarium* and *Lioconcha*, except the section *Gouldia; Meretrix*, and most of the sections of *Cytherea*, except *Cytherea* and *Ventricola*, *Mysia*, *Gomphina*, *Macridiscus;* most of the sections of *Katalysia*, and all the great group of *Paphia*, except the usually dull and unattractive *Protothaca*, are unknown in the waters of the New World.

On the other hand, *Transennella*, *Pachydesma*, *Hysteroconcha*, *Cyclinella*, and *Parastarte* appear to be exclusively American. *Eutivela* and *Eucallista* belong to the southeastern shores of America, *Liocyma* to the boreal seas, *Saxidomus* and *Protothaca* to the west coast of America, with slight extensions to northeastern Asia and Australasia. *Venus* is originally and typically American, with one emigrant in northern Japan. *Gemma* and *Psephidia* agree in the main with *Venus*. No member of the group of *Circe* or *Gafrarium* occurs on the Pacific coast, though I anticipate that *Gouldia* will turn up there sooner or later. *Chionella*, *Pitaria*, *Katalysia*, and *Venerupis* are almost ubiquitous. Of the Dosiniinæ only *Clementia* and *Dosinidia* are known to be residents of America. In harmony with the late development and specialization of the family is the fact that of the one hundred and thirty-seven species known as American only two exist on both shores of North America. Eighteen species extend through the temperate and boreal regions, belonging to twelve groups, of which *Saxidomus* and *Psephidia* have no representatives known in our tropical waters. The Tropics in America have representatives of twenty-nine groups, of which *Tivela* and *Chione* are the most prolific in species; none of the other groups exceeds four species. In individuals the groups of the Temperate Zone seem to be most prolific, such as *Venus*, *Protothaca*, *Saxidomus*, and *Agriopoma*, and from these the greater portion of the food supply derived from members of this family by man is obtained.

The southern limit of the tropical fauna on the west coast of South America is near Payta, Peru. On the east coast it descends at least as far as Rio de Janeiro, its northern limit reaching the latitude of Cape Hatteras offshore and Cape Canaveral on the actual coast. On the west coast the temperate fauna meets the northernmost extension of the tropical fauna near Point Conception, California. The northern limit of the strictly temperate-region fauna, on the west, is the line of floating ice in winter in Bering Sea, about the latitude of the Pribilof group of islands. On the east we may put the boundary near Cape Breton Island, but, owing to the inshore polar current on this side of the continent, the arctic species reach farther south and the census of the temperate fauna is more meager than on the more favored northwest coast of the continent or the western shores of Europe in the same latitude.

The recognizable ancestry of the Veneridæ appears in the Upper Cretaceous or Lower Eocene. No true Venerid, in the strict sense, appears before the Tertiary. The modifications followed through the successive horizons are most interesting. Thus, in the Oligocene we have *Hyphantosoma* with fine zigzag chiseling of the surface. In the Pliocene this sculpture is obsolete and its traces hardly to be found. The recent type has a smooth surface, but when attacked by decay the manner in which the shell weathers reveals the zigzag internal structure hidden under an apparently normal, smooth exterior, and the color-pattern frequently follows a zigzag lineation which is no longer expressed in terms of sculpture.

The beauty of the shells has led in some cases to a traffic in them by means of aboriginal trade. Thus *Hysteroconcha* was long carried to the Orient by the Lascar crews of ancient Spanish galleons, and this has led to wrong ideas of geographical distribution. *Meretrix* is a favorite with the Chinese and Japanese, not merely as a source of food or ornament, but is incorporated into lacquer work and imitated in porcelain or pottery. The common *Venus* of our own eastern coast was the source from which the Dutch and Indians prepared their shell money or wampum and ceremonial belts. A south European species in ancient times was the emblem of Aphrodite, and in the South Seas species of Veneridæ were largely used for personal adornment.

TABLE OF DISTRIBUTION OF NORTH AMERICAN VENERIDÆ.

W.=WEST COAST; E.=EAST COAST.

[Extralimital species in parentheses.]

GENUS AND SECTION.	Temperate or Oregonian.		Tropical or Panamic.	
	W.	E.	W.	E.
Dosinia:				
Dosinidia	....	....	3	3
Clementia	....	....	1	....
Transennella	1	....	1	3
Tivela	....	....	7	5
Pachydesma	....	....	1	(1)
Gafrarium:				
Gouldia	....	....	....	3
Macrocallista	....	....	....	1
Chionella	....	....	4	1
Amiantis	....	....	1	....
Eucallista	....	....	....	1
Callocardia	....	....	....	1
Agriopoma	....	1	1	3
Pitaria	....	....	6	6
Hysteroconcha	....	....	2	1
Lamelliconcha	....	....	3	1
Cytherea	....	....	1	1
Ventricola	....	....	4	4
Saxidomus	2	....	....	....
Cyclinella	....	....	4	1
Chione	....	....	11	5
Timoclea	....	....	4	4
Lirophora	....	....	4	2
Anomalocardia	....	....	2	5
Venus	1	1	1	2
Marcia	1	....	1	....
Venerella	1	....	....	....
Protothaca	1	....	2	....
Callithaca	1	....	....	....
Liocyma	3	1	....	....
Venerupis	1	....	2	....
Gemma	....	1	....	1
Parastarte	....	....	....	1
Psephidia	2	....	....	....
Totals in each fauna	14	4	66	55
Species native to both oceans	....	....	2	....
	14	4	64	55
Total North American Veneridæ	....	....	....	137

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Family VENERIDÆ.

The subdivisions adopted are characterized as follows:

Subfamily DOSINIINÆ.

Hinge with three left and three or four right cardinals, usually with an anterior left lateral fitting into a pit in the opposite valve and sometimes a developed posterior right lateral. Siphons long and united to their tips; foot large, arcuate, without a byssus or byssal groove; shell usually orbicular and generally more or less compressed, with a distinct pallial sinus.

A. *Anterior and sometimes posterior laterals present, the lunule impressed, but not distinctly limited.*

Genus DOSINIOPSIS Conrad, 1864.

Type, *D. Meekii* Conrad. Eocene.

Shell orbicular, heavy, concentrically striated, with a thick, polished periostracum; lunule impressed, but not circumscribed distinctly, and there is no defined escutcheon; inner margins smooth; pallial sinus short, free, acutely angular, and ascending; hinge strong, with corrugated nymphs and a strong rugose left anterior lateral fitting into a rugose pit in the opposite valve; right valve with a stout distinct posterior right lateral, which fits into an excavated socket in the left valve.

This is the only genus of the family with a distinctly developed posterior lateral tooth, and if it were not for the number of cardinals and the presence of a pallial sinus it might be referred to *Cyprina*.

Subgenus **Æora** Conrad, 1870. Type, *Æ. cretacea* Conrad. Cretaceous.

This is still imperfectly known, but differs from *Dosiniopsis* chiefly by being smaller, more delicate, and of a more elongated form.

Subgenus **Pelecyora** Dall, 1902. Type, *Cytherea hatchetigbeënsis* Aldrich, 1886. Eocene.

Shell orbicular, with rugose nymphs, simple anterior lateral and socket; no posterior lateral; the pallial sinus narrow, angular, ascending; the cardinals entire except the right posterior one, which is bifid; otherwise as in *Dosiniopsis*, though the only known species is very much smaller than the known species of *Dosiniopsis*.

This group differs from *Dosiniopsis* by its smooth lateral and socket, and by the absence of the posterior lateral and socket, and by its relatively deeper pallial sinus. From *Æora* the same characters, as well as the nonbifid left cardinals and orbicular form, suffice to distinguish it. The rugosity of the nymphs is more like the semiradial rugæ in *Tivela* than the fine granulations of the type of *Dosiniopsis*.

B. *Anterior lateral tooth and a defined lunule present.*

Genus DOSINIA Scopoli, 1777.

Type *D. africana* Hanley (Le Dosin, Adanson, 1757).

This is *Cytherea* (sp.) Bolten, 1798; *Orbiculus* α and β, Megerle, 1811; *Arthemis* (Poli) Oken, 1815; *Asa* (Leach) Basterot, 1825; *Arctoë* Risso, 1826; *Exoleta* Brown, 1827; *Artemis* Conrad, 1832; *Arctoa* Herrmannsen, 1846; *Cerana* Gistel, 1848; *Assa* (Leach) Gray, 1851; *Amphithæa* Leach, 1852; but not *Dosina* Gray, 1838.

Section *Dosinia* s. s.

Lunule impressed, small; escutcheon narrow, elongate, flattish, bordered on each side by a ridge or keel, at which the concentric sculpture tends to become lamellose; middle cardinals often grooved or bifid, the other teeth smooth; pallial sinus angular, ascending, usually narrow and extended forward at least halfway from the posterior to the anterior adductor; valves moderately convex.

The form of the escutcheon differs in this group from an obscure flattening, often unequal in the two valves, to a distinctly keeled area with sculpture differing from that outside the boundary, but in the series of species almost every gradation between these forms may be observed.

Section *Orbiculus* Megerle, 1811. Type, *Venus exoleta* Linnæus.

In this section there is no escutcheon, the pallial sinus is very long and narrow, and the anterior lateral is strong.

Orbiculus α Megerle, founded on *Venus prostrata* Linnæus, is a typical *Dosinia*. Most of the generic synonyms cited under the genus were based on the common European species which is the type of this section. The young do not retain any corrugations on the posterior cardinals.

Section *Austrodosinia* Dall, 1902. Type, *Cytherea anus* Philippi. New Zealand.

Lunule deeply impressed, escutcheon impressed and bordered by prominent keels; pallial sinus short and angular; anterior lateral and the pit into which it is received, and usually some of the anterior cardinal teeth sharply corrugated; the middle cardinals bifid.

This group is represented in New Zealand and Japan.

Section *Dosinisca* Dall, 1902. Type, *Artemis alata* Reeve.

Areas of the lunule and escutcheon pouting mesially, defined by a deep sulcus, forming a posterior wing which recalls *Phacoides*; sculpture of fine, rather distant, sharp lamellæ, sometimes with radial striation; pallial sinus deep and angular.

This group is distributed in Australia and Japan.

Section *Dosinorbis* Dall, 1902. Type, *Artemis bilunulata* Gray. Japan.

Lunule and escutcheon deeply impressed, the former surrounded by a larger area bordered as is the escutcheon by a lamellated keel; valves compressed, beaks produced, sculpture on the middle of the disk obsolete, becoming lamellæ laterally; pallial sinus short, angular; right posterior margin grooved beyond the hinge plate, to receive the beveled edge of the opposite valve.

This large and remarkable species appears to be unique in the genus. In the young the dorsal margins pout on each side of the ligament.

Section *Dosinidia* Dall, 1902. Type, *Venus concentrica* Born.

Valves, suborbicular, subcompressed, white, with a sculpture of concentric grooving, never lamellose, furnished with an obvious periostracum; lunule small, impressed; escutcheon absent; pallial sinus ample, ascending, angular in front; posterior cardinals serrate or corrugated in the nepionic young, smooth in the adult.

This group is confined to the tropical and warmer temperate seas of America.

Section *Dosinella* Dall, 1902. Type, *Cytherea angulosa* Philippi. East Indies.

Valves suborbicular with a shallow flattish lunule; the escutcheon narrow, flattish, hardly defined; pallial sinus ample, ascending, deep, bluntly rounded at the anterior end; anterior lateral and posterior right cardinal teeth absent or obsolete.

There are a few small species in which the bight of the pallial sinus is rounded, but in this large form the contrast between the blunt rounded form and the angular form usual in the genus is so marked that, after some hesitation, taking the obsolescent hinge-teeth into consideration, it seemed advisable to separate it sectionally.

C. *Lateral teeth absent, no lunule or escutcheon.*

Genus CYCLINA Deshayes, 1849.

Type, *Venus sinensis* Gmelin. China seas.

Soft parts like *Dosinia;* shell orbicular, concentrically and radially striate, without lunule or escutcheon; inner margins crenate; pallial sinus angular, ascending; teeth as in *Dosinia*, but without laterals, the posterior right cardinal obsolete.

It is not *Cyclinus* Kirby, *Coleoptera*, 1837.

Genus CLEMENTIA Gray, 1842.

Type, *Venus papyracea* Gray.

Soft parts as in *Dosinia*, according to Woodward; valves thin, concentrically undulate, convex, without lunule or escutcheon; inner margins simple, sharp; pallial sinus subangular, ascending; three cardinal teeth in each valve, the posterior right cardinal bifid; lateral teeth absent.

This is *Blainvillia* Huppé, 1854, not of Desvoidy, *Diptera*, 1830.

Subfamily MERETRICINÆ.

An anterior lateral tooth present; though sometimes obsolete, traces of it can always be detected in normal specimens.

Genus GRATELOUPIA Desmoulins, 1828.

Type, *Donax irregularis* Basterot. Miocene.

Valves elongate-oval, concentrically striate; three cardinals in each valve, the posterior right cardinal fused with the nymphal rugosities; the pallial sinus long and acute, reaching to the vertical of the anterior lateral lamina.

Subgenus **Cytheriopsis** Conrad, 1865. Type, *Cytherea hydana* Conrad. Eocene.

Valves trigonal, recalling *Tivela*, the left posterior cardinal fused with the nymphal rugosities; the pallial sinus short and rounded.

This is not *Cytheropsis* McCoy, 1849, and if the two names are judged incompatible, might be called *Grateloupina.* It is probably the precursor of *Grateloupia* and *Tivela.*

Genus TRANSENNELLA Dall, 1883.

Type, *T. conradina* Dall.

Shell small, having the general form and coloration of *Tivela*, but a hinge with three cardinals in each valve, the middle left cardinal bifid, and an elongate left lateral received into a socket in the opposite valve; the hinge has no rugosities, the lunule but not the escutcheon is defined, internal margins sharply tangentially grooved with numerous sulci; the pallial sinus angular, free, obliquely ascending.

Tropical and subtropical waters of America; receding in time to the Miocene. This group is unique in the family in the peculiar sulcation of the inner margin, which is only paralleled elsewhere once among the Astartidæ. A Pacific coast species is viviparous.

Genus TIVELA Link, 1807.

Type, *Venus corbicula* Gmelin (= *V. mactroides* Born).

Shell porcellanous, solid, smooth externally with a dehiscent periostracum; the coloration variable with a tendency toward dark brown and purple; valves trigonal, subequilateral, with prominent beaks and a short ligament; lunule large, faintly defined, escutcheon not defined; pallial sinus small, free, rounded in front; hinge variable with anterior laterals and from three to six cardinals, partly rugose and some of which may be bifid. Habitat, subtropical and tropical seas.

Section *Tivela* s. s. Type, *Venus mactroides* Born.

Valves trigonal, with smooth interior margins, usually a pilose periostracum over a polished surface; cardinals varying in different species.

This is *Trigona* Megerle, 1811, not Jurine, *Hymenoptera*, 1807; and perhaps *Dollfusia* Cossmann, 1886, which I know only by figures. The group is unique in the variability and occasional large number of cardinals, which are perhaps due to splitting up of the originally single posterior cardinals.

Section *Pachydesma* Conrad, 1854. Type, *Donax stultorum* Mawe.

Shell very large and ponderous, with smooth interior margins and a thick vernicose periostracum; hinge with four cardinals in each valve.

This is *Trigonella* Conrad, 1837, not of Da Costa, 1778. It is a Californian type.

Section *Eutivela* Dall, 1891. Type, *E. perplexa* Stearns, Argentina.

Shell small, elongate-trigonal, with crenulate interior margins, thin, polished periostracum, three left and four right cardinal teeth.

This type points the way toward *Sunetta*.

Genus SUNETTA Link, 1807.

Type, *Donax scripta* Linnæus.

Shell variable in form, smooth or concentrically sculptured, polished, often with vivid coloration; with an impressed, unequally divided lunule, larger in the right valve, and a deeply excavated escutcheon; posterior end of shell shorter than the anterior; pallial sinus wide, short, and rounded; inner margins conspicuously crenate; three cardinals in each valve, and rather elongate anterior laterals.

Eocene of south Europe and tropical seas of the Old World.

Section *Sunetta* s. s. Type, *Donax scripta* Linnæus.

Shell elongate-ovate, more or less inequilateral, the edge of the posterior cardinals finely rugose; sculpture concentrically sulcate or striate.

This is *Cuneus* Megerle, 1811, not of Da Costa, 1776; and *Meroë* Schumacher, 1817.

Section *Solanderina* Dall, 1902. Type, *S. solandri* Gray.

Shell inflated, smooth, subequilateral.

Section *Sunettina* Jousseaume, 1901. Type, *S. sunettina* Jousseaume, *S. menstrualis* Menke, etc.

Shell suborbicular, compressed, smooth.

Genus GAFRARIUM Bolten, 1798.

Type (by elimination), *Venus pectinata* Linnæus.

Shell equivalve, subequilateral, with a simple or slightly sinuous pallial line; three cardinals in each valve, entire or faintly grooved, and the usual anterior laterals; surface sculptured. Tertiary and recent warm seas of the Old World.

Section *Gafrarium* Bolten, s. s.

Surface with strong, chiefly radial, more or less dichotomous sculpture, that of the posterior slope differing from the rest; valves moderately convex, umbones subcompressed with a narrow lunule and feebly defined escutcheon; pallial line simple, inner margins of the valves crenate, the ligament sunken but not immersed; middle left cardinal feebly grooved.

This is *Paphia* Oken, 1815, not Bolten, 1798, or Lamarck, 1801; *Crista* Römer, 1857; and *Circe*, species, of many authors.

? Section *Radiocrista* Dall, 1902. Type, *Venus pulcherrima* Deshayes, Journ. de Conchyl., VIII, 1860, p. 381, pl. XIV, figs. 1, 2. Tertiary.

Shell with the form of *Chionella* the disk and anterior part elegantly, regularly, concentrically sulcate; margins of the dorsal area behind separated from the sulcate area by strong radial ribbing; the lunule not definitely circumscribed, but with its margins thickened and surface concentrically striated or smooth; escutcheon elongate-ovate, equally parted between the valves, nearly smooth. Interior?

The horizon and internal characters of this remarkable fossil are unknown, but it is provisionally located here, pending further information.

Section *Gouldia* C. B. Adams, 1847. Type, *Thetis cerina* Adams.

Shell small, reticulately sculptured, the radials toward the ends of the valves, and the concentric sculpture in the middle of the disk stronger; there is no specialized posterior area; moderately convex, the umbones not compressed; pallial line slightly flexuous behind, cardinals and inner margins of the valves entire.

Warm-temperate and tropical seas.

This group is *Thetis* C. B. Adams, 1845, not of Oken, 1815, or Sowerby, 1826. It is not *Gouldia* Bonaparte (*aves*), 1850. It is the only representative of the *Gafrarium* or *Circe* group in American Tertiary or recent seas, and has not yet been found on the Pacific coast.

Subgenus **Circe** Schumacher. Type, *Venus scripta* Linnæus.

Shell compressed, with only concentric sculpture, with smooth compressed beaks, narrow lunule and escutcheon; pallial line simple, inner margins smooth; posterior right cardinal grooved; ligament deeply sunken, but not entirely immersed.

Section *Parmulina* Dall, 1902. Type, *Circe corrugata* (Dillwyn) Deshayes.

Shell with the umbonal region flattened and coarsely divaricately ribbed, the rest of the surface concentrically sculptured; disk (except the umbones) convex; pallial line slightly flexuous, inner margins finely crenulate; lunule and escutcheon narrow, flat, the ligament depressed; cardinals entire or faintly grooved.

Section *Circenita* Jousseaume, 1888. Type, *C. arabica* Lamarck.

Valves convex; surface feebly concentrically sculptured, the beaks not compressed; posterior slope without specialized sculpture; lunule distinct, narrow, escutcheon hardly defined; ligament hardly depressed; pallial line with a minute sinus, the inner margins of the valves entire.

Genus LIOCONCHA Mörch, 1853.

Type, *Venus castrensis* Linnæus.

Shell solid, porcellanous, suborbicular, smooth or concentrically sculptured, vividly colored; lunule sharply circumscribed, impressed, but no defined escutcheon; ligament almost immersed, pallial line slightly flexuous, inner margins smooth, anterior left and posterior right dorsal margins grooved to receive the beveled edge of the opposite valve; anterior lateral large and strong; three smooth, entire cardinals in each valve.

Tropical seas of the Old World.

Genus MACROCALLISTA Meek, 1876.

Type, *Venus nimbosa* Solander.

Shell ovate, microscopically radially lineated, with low concentric waves, or smooth, with vivid coloration and vernicose periostracum; a defined lunule, but unequally divided between the valves; no defined escutcheon; internal margins smooth, pallial sinus free, ample, pointed in front and horizontally directed; cardinals three in each valve, smooth and entire, except a bifid right posterior tooth.

Section *Macrocallista* s. s.

Shell much elongated, the pallial sinus short, the posterior cardinals slender and elongated.

The type is better known as *Cytherea* or *Callista gigantea* (Gmelin) Lamarck.

Section *Chionella* Cossman, 1886. Type, *Cytherea ovalina* Deshayes.

Shell ovate-trigonal; pallial sinus long; the posterior cardinals short.

This is *Chione* Gray, 1838, not Megerle, 1811, or Gray, 1851; *Dione* Gray, 1851, not of Hübner, *Lepidoptera*, 1816; and *Callista* Mörch, 1853, not of Leach, 1852.

Genus AMIANTIS Carpenter, 1863.

Type, *Cytherea callosa* Conrad.

Shell ovate, concentrically waved, with vernicose periostracum; lunule and a linear escutcheon, defined; inner margins smooth; pallial sinus ample, acute in front, free below, slightly ascending; anterior cardinal very thin; anterior laterals large and strong.

Section *Amiantis* s. s.

Shell with two obscure radial ribs internally, near the middle of the disk; posterior cardinals elongated, strong, the right one bifid, the other teeth entire; the posterior left cardinal and the edge of the right nymph rugose; the posterior right dorsal margin beyond the hinge plate grooved to receive the edge of the opposite valve. Californian.

This is called *Amyantis* by Stoliczka, 1871.

Section *Eucallista* Dall. 1902. Type, *Cytherea purpurata* Lamarck.

Shell with the posterior cardinals short; the opposite faces of the nymphs with interlocking rugosities; the teeth smooth; interior without radial ridges.

Lamarck himself called attention to the remarkable corrugated areas of this shell which recall those of *V. mercenaria.* It is a Brazilian species which has been confounded with one from west America.

Genus MERETRIX Lamarck, 1799.

Type, *Venus meretrix*, Linnæus.

Shell trigonal, plump, thin, nearly equilateral, smooth with a vernicose periostracum, a peculiar olivaceous tone of coloration; lunule and escutcheon not circumscribed or distinctly defined; three cardinals in each valve and well-defined anterior laterals; the middle left and two anterior right cardinals entire, smooth, the others grooved or bifid; right nymph and posterior left cardinal corrugated; anterior left and posterior right dorsal margins beyond the hinge plate sharply grooved to receive the edge of the opposite valve; internal margins smooth; the pallial line with a shallow arcuate flexuosity, but no angular sinus; ligament hardly depressed.

Distribution chiefly in the China seas, Japan, and the Indo-Pacific region.

This group is *Cytherea* (Lamarck) and *Citherea* Roissy, 1805, and Lamarck, 1806; *Cytheræa* Defrance, 1818; *Nympha* Mörch, 1853, not Fitzinger, 1826; and *Meretrix*, *ex parte*, Deshayes, 1853.

Genus CALLOCARDIA A. Adams, 1864.

Type, *C. guttata* A. Adams.

Shell ovate, plump, thin, concentrically striated with more or less involute umbones; pallial sinus nearly obsolete; lunule feebly circumscribed, not impressed, escutcheon not defined; left anterior lateral received between two obsolete laminæ in the opposite valve; three cardinals in each valve not radiating from a point under the umbo, on the dorsal valve margin; the two anterior left cardinals continuous above and separated from the valve margin by a sulcus; the anterior and posterior right cardinals similarly connected, and dorsally separated by a groove from the margin; the arch of the two left cardinals fits over the middle right cardinal, the arch of the outer right cardinals over that of the two left ones, so that the middle right and the posterior left cardinals remain isolated; the dorsal margins beyond the hinge plate, in front in the left and behind in the right, are grooved to receive the beveled edge of the opposite valve.

In this group the teeth retain in the adult state the conditions which normally obtain in the early stages of hinge development as shown by Bernard.

The group is identical with *Caryatis* (part) Römer, 1862, not of Hübner, 1816; *Veneriglossa* Dall, September, 1886; and *Atopodonta* Cossmann, October, 1886. It is distributed in tropical and temperate seas and goes back to the Eocene in time.

The type was named *Callocardia guttata* by A. Adams in 1864. In 1888 Mr. Sowerby renamed it *Cytherea isocardia* on account of the existence of a *Cytherea* (*Callista*) *guttata* of Römer. The latter, however, was not described until 1866, so that it does not antedate Adams's name. If Römer's form is entitled to specific rank, it will not require a new name, as under the present arrangement it will be referable to the genus *Macrocallista*, section *Chionella*.

Subgenus **Agriopoma** Dall, 1902. Type, *Cytherea texasiana* Dall, 1892.

This differs from the typical *Callocardia* by its large, heavy, and chalky shells, without the involute umbones or any color pattern, and by the presence of a deep and angular pallial sinus. It is more northern in distribution than *Callocardia* proper, and more limited in geographical range, though receding to the Eocene in America. The peripheral species indicate a transition in the cardinals of the right valve toward the conditions found in the following group:

Genus PITARIA Römer (em.), 1857.

Type, *Venus tumens* Gmelin.

Shell trigonal, plump, concentrically striate or rippled, with an inconspicuous periostracum and delicate coloration; lunule circumscribed, but the escutcheon not defined; inner margins smooth, pallial sinus ample, elongate, somewhat ascending, pointed in front; middle cardinal stout, the others slender; the posterior cardinals feebly grooved, the others entire; the cardinals of the right valve discontinuous where they touch the dorsal margin and not separated from the latter by a groove; anterior lateral adjacent, distinct; nymphs and teeth smooth; dorsal margins grooved as in *Meretrix*. Widely distributed in the Tropics.

Römer's original name, *Pitar*, is a vernacular African word, not really entitled to be used without Latinization, for which, in 1862, he substituted *Caryatis*, which is preoccupied in Lepidoptera since 1816. It is probable that a Latinized form as above should be adopted for the group.

Section *Pitaria* s. s. Type, *Venus tumens* Gmelin.

Shell smooth or with concentric striation, usually convex, subtrigonal or ovate, with a pointed sinus.

Section *Hyphantosoma* Dall, 1902. Type, *Cytherea carbasea* Guppy, 1866. Oligocene.

Shell with zigzag sculpture on the surface like *Textivenus* Cossmann, of the Venerine series.

Section *Tivelina* Cossmann, 1886. Type, *Cytherea tellinaria* Lamarck. Eocene.

Shell pointed behind with a Tellina-like twist to the valves, which are concentrically striate; hinge as in *Pitaria;* pallial sinus short, bluntly rounded.

Subgenus **Hysteroconcha** Fischer, 1887. Type, *Venus dione* Linnæus.

Shell subtrigonal, plump, concentrically laminate; lunule and escutcheon defined by incised lines and impressed, the laminæ becoming spinose near the boundary of the escutcheon; shell with tinted coloration not in patterns; inner margins smooth, pallial sinus linguiform, ample, free, slightly ascending; hinge as in *Pitaria*, the edges of the nymphs finely granular and the stout middle cardinal sometimes obscurely channeled.

Tropical American waters.

This is *Dione* Gray, 1847, not Gray, 1851, nor Hübner, 1816; and *Venus* Megerle, 1811, not of Lamarck, 1799.

Section *Lamelliconcha* Dall, 1902. Type, *Cytherea concinna* Sowerby.

Shell trigonal, subcompressed, concentrically ribbed or laminate, without spines; the edges of the nymphs smooth; otherwise like *Hysteroconcha*.

Tropical seas, especially in America.

Genus CYTHEREA Bolten, 1798.

Types (by elimination), *Venus puerpera* Linnæus, *V. rugosa* Gmelin, and *V. verrucosa* Linnæus.

Shell large and rotund, convex, with strong predominantly concentric sculpture with well-marked lunule and escutcheon, the latter unequally divided, larger in the left valve; umbones plump, ligament deep seated; cardinals large and partly bifid; anterior lateral small, papilliform; inner margins crenate; pallial line with a short rounded sinus.

Subgenus **Cytherea** Bolten, s. s. Type, *Venus puerpera* Linnæus.

Shell large, reticulately sculptured, the right portion of the escutcheon produced over the sunken ligament; lateral tooth minute.

Tropical seas.

This is *Antigona* Römer, 1857, not Schumacher, 1817.

Section *Clausina* Brown, 1827. Type, *Venus verrucosa* Linnæus.

Shell large, strongly concentrically lamellose, with obscure divaricating radials toward the ends; right portion of the escutcheon not overlapping the ligament; pallial sinus small, narrow, angular.

Tropical and temperate seas.

This is *Venusarius* (Dumeril) Froriep, 1806 (not binomial); *Dosina* Gray, 1838; *Venus* Swainson, 1840, not Lamarck, 1799; *Calista* (Poli) Leach, 1852, not Mörch, 1853; *Callista* Fischer, 1887, but not *Clausina* Römer, 1857.

Section *Ventricola* Römer, 1857. Type, *Venus rugosa* Gmelin.

Shell large with strong, distant, evenly spaced concentric lamellæ, between which are smaller concentric threads; pallial sinus small, angular, lunule deeply impressed; right part of the escutcheon obsolete.

Tropical seas of both hemispheres.

Subgenus **Aphrodina** Conrad, 1868. Type, *Meretrix tippana* Conrad. Cretaceous.

Shell concentrically striated, with a circumscribed lunule, but no defined escutcheon; inner margins smooth, pallial sinus ample, free, ascending, rather rounded in front; hinge with three cardinals in each valve, the right posterior cardinal bifid; an elongate anterior lateral corrugated on both sides and received into a pit with similar corrugations; nymphs smooth.

This form wants the posterior lateral and the granular nymphs of *Dosiniopsis*, and differs from *Cyclorisma* by its form, the presence of an anterior lateral and a defined lunule.

Subgenus **Antigona** Schumacher, 1817. Type, *Cytherea lamellaris* Schumacher (+ *Dosina lamarckii* Gray).

Shell having the form and sculpture of a *Chione* (Megerle), but with a lamelliform well-developed anterior lateral entering a socket in the right valve; the posterior right cardinal broad and deeply bifid; pallial sinus small, triangular.

Schumacher's type has been confused with *Chione cancellata*, but an examination of his figures and references makes his meaning plain.

Section *Antigona* s. s.

Shell rather elongate, with profuse concentric lamellation crenulated by fine radial ribs; lunule deeply impressed, the ligament exposed, the overlap of the escutcheon small.

This is not *Antigonus* Hübner, 1816, or *Antigona* Römer, 1857.

Section *Artena* Conrad, 1870. Type, *Venus staminea* Conrad. Miocene.

Shell trigonal or short, with acute concentric laminæ, between which are minute elevated concentric lines; lunule not deep; escutcheon large, not overlapping; posterior right cardinal narrow, laminar; other features as in *Antigona*.

This section bears to *Antigona* much such a relation as *Ventricola* does to typical *Cytherea*, in the other subgenus. It was called *Artenia* by Tryon in 1884.

Subgenus **Circomphalus** Mörch, 1853. Type, *Venus plicata* Gmelin (= *V. dysera* Linnæus *pro parte*).

Shell cordate, compressed, with distant elevated reflected laminæ which have leaflike expansions near the posterior border; lunule and escutcheon, impressed, striate, sharply limited, unequally divided between the valves; ligament deeply sunken; inner margins crenate, pallial sinus small, triangular; anterior right and posterior left cardinals slender, laminar, entire, the others bifid; a minute pustular anterior left lateral present.

This is *Anaitis* Tryon, 1884, not of Duponchel, 1829, or Römer, 1857; and *Chiona* Römer, 1857, not of Mörch, 1853. *V. calophylla* Hanley, also belongs here.

Subgenus **Lepidocardia** Dall, 1902. Type, *Chione floridella* Gray (+ *Venus africana* Philippi).

Shell small, compressed, donaciform, smooth or concentrically striated, polished; lunule defined, but there is no defined escutcheon; internal margins smooth; pallial sinus linguiform, pointed in front, horizontally directed, partly confluent with the pallial line below; dorsal margins beyond the hinge plate grooved; teeth delicate, the anterior laterals well developed, the posterior right and anterior two left cardinals more or less distinctly grooved.

Though compressed, this form recalls *Gomphina* by its external characters.

Genus SAXIDOMUS Conrad, 1837

Type, *S. nuttallii* Conrad.

Shell large, rude, chalky, ovate-quadrate, with low beaks, and concentric usually feeble sculpture; the ligament is strong and not depressed; there is no defined lunular area or escutcheon; internal margins smooth; pallial line with a deep, rounded sinus; hinge with three cardinals in each valve; the posterior right cardinal bifid; anterior laterals closely adjacent to the cardinals, one of the left ones often in line with the anterior cardinal.

Shores of the North Pacific.

This group has been generally misunderstood and placed, as by Deshayes, near *Tapes*. His group of radial sulcate *Saxidomus*, of 1853, all belong to *Callithaca*. The anterior lateral is so close to the cardinals that it has been counted in with them. The animal is meretricine, with long, closely united siphons. The group on the Pacific coast recedes to the Eocene in time.

Subfamily VENERINÆ.

ANTERIOR LATERAL TEETH ABSENT.

Genus CYPRIMERIA Conrad, 1864.

Type, *C. excavata* Morton. Cretaceous.

Pallial line feebly flexuous behind.

Subgenus **Cyclorisma** Dall, 1902. Type, *Cyclothyris carolinensis* Conrad. Cretaceous.

Pallial line deeply sinuated.

This is *Cyclothyris* Conrad, 1875; not of McCoy, *Brachiopoda*, 1844.

Genus THETIRONIA Stoliczka, 1871.

Type, *Thetis major* Sowerby, 1826. Cretaceous.

Surface granulose; pallial sinus high, angular vertically ascending; no lunule or escutcheon. This is *Thetis* Sowerby, 1826, not of Oken, 1815.

? Subgenus **Thetiopsis** Meek, 1876. Type, *T. circularis* Meek and Hayden. Cretaceous.

Smaller and smoother, the sinus shorter and irregular at its anterior basal part.

This is *Tethiopsis* Fischer, 1887.

Genus MYSIA (Leach MS.) Lamarck, 1818.

Type, *Venus undata* Pennant.

Siphons separated; hinge with two right and three left cardinal teeth; a circumscribed lunule, but no escutcheon. European.

This is *Lucinopsis* Forbes and Hanley, 1848, but not *Mysia* Gray, 1847.

Genus CYCLINELLA Dall, 1902.

Type, *Dosinia tenuis* Recluz.

Three cardinal teeth in each valve; otherwise like *Mysia*. American.

This genus extends to the Oligocene in time.

Genus CHIONE Megerle, 1811.

Type, *Venus cancellata* Lamarck.

Three cardinal teeth in each valve; pallial sinus short, angular; lunule and escutcheon defined, sculpture cancellate, inner margins of the valves crenate; concentric sculpture dominant.

Subgenus **Chione** s. s. Type, *V. cancellata* Lamarck.

This is *Chiona* Mörch, 1853, and of Römer, 1857; *Circomphalus* Adams, 1857; and *Omphaloclathrum* Tryon, 1884, not Mörch, 1853. It is not *Chion* Scopoli, 1777; *Chionis* Forster, 1788; *Chione* Desvoidy, *Diptera*, 1830; *Chionea* Dalman, 1816; nor *Chione* Gray, 1838. In a few of the larger species like *C. gnidia*, a feeble fourth cardinal is sometimes present in the right valve below the ligament; and the right posterior dorsal margin behind the ligament is sometimes grooved to receive the beveled edge of the opposite valve. In *Gomphina* alone have I found any anterior grooving of the margin in the left valve. The siphons are separate and short, the cardinals entire or feebly channeled.

Section *Chione* s. s. (See above.)

Section *Timoclea* Brown, 1827. Type, *Venus ovata* Pennant.

Sculpture predominantly radial, the concentric element feeble, the escutcheon smooth; the middle left and two posterior right cardinal teeth grooved.

This is *Pasiphaë* Leach, 1852, not Risso, 1826; *Leukoma* Römer, 1857, and *Leucoma* Stoliczka, 1871, not of Stephens, 1829; *Cytherea* H. and A. Adams, 1857, not of Bolten, 1798; *Murcia* (part) Römer, 1857, not of Koch, 1835.

Section *Clausinella* Gray, 1851. Type, *Venus fasciata* Da Costa.

Sculpture of broad concentric waves and fine concentric striæ, the radials obsolete; the waves not pinched out behind; the ligament covered by the margin of the valves when closed.

This is *Zucleica* Leach, 1852.

Section *Lirophora* Conrad, 1864. Type, *Venus athleta* Conrad; a recent species is *V. paphia* Linnæus.

Sculpture of broad concentric waves, attenuated and often conspicuously lamellose distally; radially striate; ligament exposed; the edges of the right nymph and posterior left cardinal with interlocking rugosities.

This is *Clausina* Römer, 1857, not of Brown, 1827; *Anaitis* (*paphia*) Fischer, 1887, not of Tryon, 1884; and *Anaitis* (part) Römer, 1857, not *Anaitis* Duponchel, 1829.

? Section *Volupia* Defrance, 1829. Type, *V. rugosa* Defrance, Eocene of Hauteville.

Shell small, sculpture superficially resembling *Lirophora*, but with lunule and posterior area defined by a deep sulcus dividing the disk into three areas crossed by thick, swollen, concentric ribs; beaks high and curved; hinge of three teeth, of which one is bifid; pallial line not sinuated?

In placing this shell here I have followed Fischer, since the species has not been well figured and the descriptions given of it are far from clear. I have not been able to obtain specimens for examination. From the very obscure figure of Defrance I should have suspected this shell to be Lucinoid and to belong somewhere in the vicinity of *Here* Gabb.

Section *Chamelea* Mörch, 1853. Type, *Venus gallina* Linnæus.

Sculpture of narrow, close concentric waves or low lamellæ, without distal lamellation or radial sculpture; teeth entire; ligament exposed; the escutcheon and lunule smooth.

This is *Ortygia* Brown, 1827, not Boie, 1826; *Hermione* Leach, 1852, not of Blainville, 1828; *Orthygia* Mörch, 1853; *Chamelæa* H. and A. Adams, 1857; *Murcia* (part) Römer, 1857, not of Koch, 1835, and probably *Parvivenus* Sacco, 1900.

Subgenus **Gomphina** Mörch, 1853. Type, *Venus undulosa* Mörch.

Valves more or less rostrate, the surface usually smooth and polished, inner margins entire; dorsal margins gooved and beveled beyond the hinge plate; the posterior right and two anterior left cardinals grooved; ligament exposed. Pallial sinus short, free, and rounded in front.

Section *Gomphina* s. s. Type, *V. undulosa* Mörch.

Valves usually heavy, solid, and very tumid; the lower edge of the right nymph and the upper edge of the left posterior cardinal with reciprocal rugosities.

This is *Marcia* (H. and A. Adams part) Chenu, 1862, and Tryon, 1884, not of Fischer, 1887; *Hemitapes* Stoliczka, 1871, not Römer (part) 1857; not *Gomphina* Chenu, 1862.

Section *Macridiscus*[a] Dall, 1902. Type, *Venus æquilatera* Sowerby.

Valves more equilateral, trigonal and compressed, less heavy and sometimes with feeble striation distally; nymphs and teeth entire, smooth.

This is *Gomphina* H. and A. Adams, 1857, not of Mörch, 1853.

Genus ANOMALOCARDIA Schumacher, 1817.

Type, *Venus fluctuosa* Linnæus.

Valves rostrate, with a vernicose periostracum, sculpture obsolete mesially; the inner margins crenulate, the ligament exposed, the lunule and escutcheon impressed; cardinal teeth entire, three in each valve, the anterior right cardinal feeble, sometimes obsolete; pallial sinus small, angular, sometimes nearly obsolete.

Section *Anomalocardia* s. s.

Surface with predominantly concentric sculpture, vernicose periostracum, and the adjacent surfaces of the posterior left cardinal and right nymph minutely rugose. America and West Africa.

This is *Triquetra* Anton, 1839, after Blainville, 1818, but not of Conrad, 1846; it is *Cryptogramma* Mörch, 1853.

Section *Anomalodiscus* Dall, 1902, Type, *Cytherea squamosa* Lamarck.

Surface with reticulate subequal sculpture, a dull papery periostracum, and the hinge without rugosities. Indo-China.

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[a] From *Macer*, not from μακρος.

Genus VENUS (Linnæus) Lamarck, 1799.

Type, *Venus mercenaria* Linnæus.

Shell large, heavy, earthy, trigonal; with faint radial and stronger concentric lamellar sculpture; lunule and escutcheon well defined; internal margins crenulate; pallial sinus small, triangular; there are two bifid cardinals in the left valve, one bifid and two anterior simple cardinals in the right valve, with a rugose area in each valve representing a supplementary cardinal below the ligament, the rugosities interlocking when the valves close; the ligament is strong and wholly exposed; the posterior dorsal margin of the right valve grooved to receive the edge of the left valve. The genus is American.

It is *Mercenaria* Schumacher, 1817, and *Crassivenus* Perkins, 1869.

Genus MARCIA (H. and A. Adams, 1857) Fischer, 1887.

Type *Venus exalbida* Dillwyn.

Shell large, subquadrate, concentrically lamellose and striated, without radial sculpture, and with a dull, earthy surface; internal margins smooth; pallial sinus small, angular, free; hinge with three left and four right cardinals, the middle ones larger and grooved above. Australasia and southern South America.

Subgenus **Marcia** s. s. (See above.)

This is a *Venus* without hinge rugosities, radial sculpture, or marginal crenation. There is a well-defined lunule, but no defined escutcheon; the ligament is exposed.

It is *Katelysia* (part) Römer, 1857, not of Tryon, 1884.

Subgenus **Katelysia** (Römer, 1857) Tryon, 1884. Type, *Venus scalarina* Lamarck.

Shell rounded-trigonal, subcompressed, very inequilateral, sculptured with concentric riblike ridges, sharper distally, polished, porcellanous, with no radial sculpture; coloration lively, anterior end sharper; lunule smooth, circumscribed, escutcheon defined only by absence of sculpture; ligament short, internal margins smooth; hinge plate buttressed between the pedal and adductor scars; three cardinals in each valve, the anterior right and posterior left slender, entire, the others grooved or bifid; the anterior left and posterior right dorsal margins beyond the hinge plate sharply grooved to receive the beveled edge of the opposite valve. South Seas.

Section *Katelysia* s. s. (See above.)

The inequilateral ovate form of these shells is quite striking. *Chamelea* Chenu, 1862, not Mörch, 1853; *Murcia* (part) Römer, 1857, not Koch, 1835; and *Catelysia* Fischer, 1887, are synonymous.

Section *Hemitapes* Römer, 1857. Type, *Venus rimularis* Lamarck.

Shell trigonal, tumid, with a keeled escutcheon and short, rounded pallial sinus.

This is otherwise essentially like the preceding section, but owing to the different form appears very distinct. It is not *Hemitapes* of Stoliczka, Tryon, and Fischer.

Section *Venerella* Cossmann, 1886. Type, *Venus hermonvillensis* Deshayes. Eocene.

Shell small, ovate, concentrically striate; lunule large, circumscribed, escutcheon not defined; internal margins smooth; pallial sinus small free, ascending, rounded in front; three cardinal teeth in each valve, the margin of the hinge plate excavated at the interspaces; posterior right cardinal long, bifid; the other teeth entire.

These forms are distinguished from the smaller species of *Katelysia* chiefly by the form and disposition of the teeth.

Section *Mercimonia* Dall, 1902. Type, *Venus Bernayi* Cossmann. Eocene.

Shell small, ovate, concentrically striate, rather tumid; hinge normal, the posterior left cardinal slender, not elongated; posterior right cardinal grooved; margins entire; the pallial sinus nearly obsolete.

This is *Mercenaria* Cossmann, 1886, not of Schumacher, 1817. The species included in Cossmann's list which possess a small but deep pallial sinus might be referred to *Venerella*, from which they hardly differ.

Section *Textivenus* Cossmann, 1886. Type, *Venus texta* Lamarck. Eocene.

Shell ovate, convex, sculptured by fine obliquely reticulate or divaricate subequal threadlike ridges; lunule small, circumscribed, escutcheon bordered by a radial ridge; internal margins smooth, pallial sinus small, angular, free; three cardinals in each valve, the right posterior cardinal broadly bifid; the right posterior dorsal margin behind the hinge plate grooved to receive the edge of the opposite valve.

Section *Samarangia* Dall, 1902. Type, *Venus quadrangularis* Adams and Reeve.

Shell rounded-quadrate, subcompressed, white, with a dull surface; sculpture of concentric striation, more forcible distally; internal margins smooth; lunule unevenly divided between the valves, smaller in the right valve; escutcheon not defined; pallial sinus moderate, angular in front, free below; three cardinals in each valve, the middle left and two posterior right cardinals bifid; hinge strong.

The species belonging to this group are massive and solid. *V. lenticularis* Sowerby is an example. The anterior left and posterior right dorsal margins are grooved behind the hingeplate to receive the beveled edges of the opposite valve.

Genus PAPHIA Bolten, 1798.

Type, *P. alapapilionis* Bolten (= *Venus rotundata* (part) Gmelin, *not* Linnæus).

Cardinals, three in each valve; the anterior right and posterior left cardinals entire, the others often bifid.

Subgenus **Paphia** s. s.

Valves elongate-oval, subcompressed, with close concentric riblets covered by a vernicose periostracum and without radial sculpture; coloration brilliant; escutcheon and lunule narrow, smooth, impressed, the lunule unequally divided, the right portion encroaching on the left; inner margins smooth; the pallial sinus free, ample, rounded in front, obliquely ascending.

The species are of warm temperate and tropical seas in the eastern hemisphere, and are reported from the Tertiaries of South Europe since the Eocene. *Eutapes* Chiamenti, 1900, and *Callistotapes* Sacco, 1900, are synonymous.

Section *Baroda* Stoliczka, 1871. Type, *Venus fragilis* D'Orbigny. Cretaceous.

Valves elongate, thin, with purely concentric sculpture; the posterior cardinals elongated, sometimes grooved, the others simple; pallial sinus ample, horizontal, rounded in front; margins entire.

This group appears to be the Mesozoic precursor of *Paphia*. The Tertiary *Taurotapes craveri* (Michelotti) Sacco, seems hardly distinct from *Baroda.*

Section *Icanotia* Stoliczka, 1871. Type *Psammobia impar* Zittel, Gosau.

This is stated to differ from *Baroda* only by the presence of more or less radial sculpture.

Section *Paratapes* Stoliczka, 1871. Type, *Venus textile* Gmelin.

Valves elongate, turgid, smooth or feebly concentrically sculptured; lunule circumscribed, narrow; escutcheon undefined; middle cardinals bifid as in *Paphia;* inner margins entire; pallial sinus obliquely ascending, small, squarish anteriorly.

This is *Textrix* Römer, 1857, not Sundeval, 1833.

Section *Protapes* Dall, 1902. Type, *Venus gallus* Gmelin (+ *V. malabarica* Dillwyn).

Valves trigonal, closely concentrically ribbed, with no radial sculpture; a vernicose periostracum; a large elongate impressed lunule, no differentiated escutcheon; smooth inner margins; an ample, obliquely ascending pallial sinus, rounded in front; the two anterior and the left posterior cardinals entire, the others bifid; all the teeth short and concentrated.

This is *Pullastra* Chenu, 1862, not Sowerby, 1826.

Subgenus **Tapes** Megerle, 1811. Type, *Venus literata* Linnæus.

Valves oblong, subcompressed, vertically expanding and subangular on the posterior dorsal margin; lunule set off by an incised line, the escutcheon defined by a carina, both long and narrow; surface concentrically grooved; internal margins smooth; pallial sinus ample, horizontal, free below, rounded in front; the posterior right and two anterior left cardinals bifid or grooved; colors lively, often with a dark lineated pattern on a paler ground.

Tropical and temperate waters of the Old World. *Parembola* Römer, 1857, is synonymous.

Section *Tapes* Megerle s. s. (See above.)

Section *Polititapes* Chiamenti, 1900. Type, *Venus aurea* Gmelin.

Valves oblong, plump, not angular above, behind; surface with fine concentric sculpture and obscure radial striation; lunule small, circumscribed, escutcheon not defined; pallial sinus short, ascending, free below, rounded in front; color delicate and variable.

The siphons are united for three-fourths of their length in *T. virgineus* which is not known to form a byssus. The group is *Tapes* Sacco, 1900, not Megerle, 1811.

Section *Pullastra* Sowerby, 1826. Type, *Venus pullastra* Montagu.

Shell oblong, tumid, blunt behind; valves finely reticulately sculptured, with hardly differentiated lunule or escutcheon; the latter nearly linear; inner margins entire; pallial sinus deep, ample, horizontal, rounded in front and confluent with the pallial line below; the two posterior right and middle left cardinals are bifid; coloration feeble. The siphons are three-fourths united in the typical species.

Section *Myrsus* H. and A. Adams, 1858. Type, *Tapes corrugatus* Deshayes.

Valves as in *Pullastra*, but the concentric sculpture is broken and corrugated, the shell more elongate, though, from its nestling habit, very variable in outline; teeth as in *Pullastra*, lunule obscure or not defined, the escutcheon with a feebly carinate margin; pallial sinus small, slightly ascending, free below and rounded in front; inner margins smooth; coloration dull and unattractive.

This is *Metis* Adams, 1857, not 1856; *Myrsopsis* (*pernarum* Bonelli) Sacco, 1900, from the Italian Tertiaries, differs but slightly.

Subgenus **Ruditapes** Chiamenti, 1900. Type, *Venus decussata* Linnæus.

Valves convex, oblong; surface dull and feebly colored; sculpture strong distally, more or less reticulate, the concentric ridges inosculating anteriorly and feeble on the middle of the disk; the radial sculpture stronger; inner margins smooth; pallial sinus large, free below, horizontal, rounded in front; lunule circumscribed, the escutcheon feebly defined; all the inner cardinals more or less bifid; the siphons wholly free from each other and a byssus present.

Temperate and tropical regions of the Old World. This is *Amygdala* Römer, 1857, not of Van Phelsum, 1774; *Cuneus* H. and A. Adams, 1857, but not of Da Costa, 1776. It is not *Amygdalum* Megerle, 1811.

Section *Ruditapes* s.s. (See above.)

Subgenus **Protothaca** Dall, 1902. Type, *Venus thaca* Molina (+ *V. dombeyi* Lamarck).

Shell ovate, convex, coloration white or dull; surface dull, reticulately sculptured, the radials usually stronger; sculpture more or less distinctly divided into three areas, the middle of the valves with chiefly radial, the anterior radial and scabrous, the posterior with irregularly concentric sculpture; lunule and escutcheon of the left valve, sharply circumscribed; in the type species the right valve shows no escutcheon and the margin partially overlaps that of the left valve but does not conceal the ligament; middle cardinals grooved or bifid; pallial sinus free, moderate, pointed in front; the inner margins sharply crenulated in the typical section.

Section *Protothaca* s. s. (See above.) The siphons are short and united, the foot hatchet-shaped and not byssiferous. The distribution of this group includes the west coast of America, Japan, and New Zealand (*V. costata* Quoy).

Section *Callithaca* Dall, 1902. Type, *Tapes tenerrima* Carpenter.

Sculpture delicate, uniform over the disk and reticulate except in distorted individuals; lunule feebly defined with no escutcheon; the dorsal margin not overlapping in the right valve; inner margins entire, otherwise as in *Protothaca*.

Distribution, Northwest America. The tropical species of *Protothaca* are maculated, the northern forms yellowish white, with a dull surface. There is no byssal groove and the papillose siphons are united to their tips in the type species. The group is *Saxidomus β* of Deshayes, 1853.

Genus LIOCYMA Dall, 1870.

Type, *Venus fluctuosa* Gould.

Shell small, white or unicolored, covered with a vernicose periostracum, and concentrically waved, without radial sculpture; lunule circumscribed, escutcheon absent; inner margins smooth; pallial sinus short, free, rounded triangular; three cardinals in each valve, the anterior right and posterior right, entire, the others bifid; siphonal tubes unequal, the anal shorter, both united to their tips; foot long and pointed, without a byssal groove; the mantle open ventrally and smooth edged.

Distribution, Boreal and arctic waters of the Northern Hemisphere.

The group was called *Lyocima* by Barrois in 1887, and the species were formerly referred to *Tapes*.

Genus VENERUPIS Lamarck, 1818.

Type, *Venus irus* Linnæus.

Valves elongate and subquadrate; sculpture radial with distant, prominent concentric lamellation; lunule and right half of the escutcheon absent, left half of the latter defined by a keel; ligament exposed; the pallial sinus short, ascending, free, blunt in front; internal margins smooth in the type species; there are three cardinals in each valve, the anterior right and posterior left entire and slender, the others broad and deeply bifid; the siphons are long, united for half their length and with papillose orifices.

The species of this group are nestlers and often deformed. They have been much confused with species of *Petricolidæ*.

The name has been spelled *Venerirupis* by Sowerby and *Venererupes* by Swainson. *Petrifora* Latreille, 1827, may be identical, but *Irus* Oken, 1815, is a synonym of *Saxicava*.

Subfamily GEMMINÆ.

SPECIES VIVIPAROUS, MINUTE.

Genus GEMMA Deshayes, 1853.

Type, *Venus gemma* Totten.

Shell subtrigonal, with concentric sculpture, a short external ligament, and large lunule, but no escutcheon; inner margin of valves crenate; pallial sinus distinct, small, triangular; siphons separate, the branchial longer and papilliferous; an elongated posterior left and anterior right lateral tooth received into a groove on the margin of the opposite valve; foot linguiform, not byssiferous.

The genus belongs to the Atlantic coast of North America, but has been introduced on the Pacific coast with seed oysters. It is represented in the eastern Tertiaries.

It is *Tottenia* Perkins, 1869.

Genus PARASTARTE Conrad, 1862.

Type, *Astarte triquetra* Conrad.

Shell trigonal, with prominent elevated beaks, equilateral, heavy, with a short ligament and large lunule, but no escutcheon; surface smooth, brightly colored, with a vernicose periostracum; internal margins crenate; pallial line slightly flexuous behind, but with no definite sinus; right valve with a strong middle cardinal and two feeble ones; left valve with two strong cardinals, but no lateral teeth; dorsal margins outside the hinge plate feebly grooved to receive the edges of the opposite valve.

This genus is confined to the coast and Tertiaries of the southeastern United States.

It is *Callicistronia* Dall, 1883, *olim.*

Genus PSEPHIDIA Dall, 1902.

Type, *Psephis lordi* Baird.

Shell small, veneriform, polished, with faint concentric sculpture; beaks not prominent; valves inequilateral, with a narrow, feebly defined lunule and no escutcheon; inner margins not crenate; pallial sinus distinct, angular; hinge with three delicate entire cardinals in each valve, but no laterals; animal with the mantle edges fused below, the siphons short, simple; an anterior opening for the foot, which is not byssiferous.

This group is confined to the Pacific coast as far as known, and is represented in the Pacific Pliocene. It is *Psephis* Carpenter, 1864, not of Guenée, *Lepidoptera*, 1854. Carpenter named several species without specifying a type in 1864. In 1865 he selected *P. lordi* Baird as type, and for the first time gave a distinctive diagnosis of the genus. Part of the species, among those originally referred to the group, belong elsewhere. *P. tantilla* appears to be a *Transennella*, and *P. tellimyalis* is the nepionic young of *Petricola*.

EAST AMERICAN SPECIES.

DOSINIA (DOSINIDIA) CONCENTRICA Born, 1780.

Florida Keys (Conrad); Martinique, Porto Rico, Guadeloupe, Virgin Islands, Santa Cruz, and St. Thomas, West Indies; Colon or Aspinwall; Maracaibo to Rio de Janeiro, Brazil.

The *Venus concentrica* of Gmelin is a mixture of various species, the name is fixed by Born's figure, which represents the southern type. The *concentrica* of early American writers was the *D. discus* of Reeve. The *D. concentrica* of Reeve is the *D. elegans* of Conrad.

The present species is *Arthemis patagonica* Philippi, 1844; *Venus philippii* Orbigny, 1847; *Venus dilatata* Solander, 1797; and *Dosinia floridana* Conrad, 1866, was probably founded on a young specimen. *D. concentrica* is the analogue of the Pacific coast *D. ponderosa*

DOSINIA (DOSINIDIA) ELEGANS Conrad, 1846.

In the offshore warm water, near Cape Hatteras, North Carolina; at Charleston, South Carolina; east and west Florida, the Tortugas, Texas, and south to Yucatan and St. Thomas, West Indies.

This fine, flat, and evenly concentrically sculptured species was figured by Lister (pl. 288, fig. 124), and is one of those long confounded under the name of *concentrica*. The young were referred to *D. obovata* Conrad by Miss Bush in 1885.

DOSINIA (DOSINIDIA) DISCUS Reeve, 1850.

Cape May, Virginia, and south on the coast of the mainland to Vera Cruz, Mexico.

This is the most compressed and dark-colored of our East Coast species and has finer and closer striation than any of the others. It is the *Artemis* or *Dosinia concentrica* of the earlier American writers, but not of Born. The color which resides in the periostracum is frequently distributed in darker and lighter zones.

TRANSENNELLA CUBANIANA Orbigny, 1847.

Cape Florida to St. Croix, West Indies.

A small, usually pure white species, living in 8 to 30 fathoms, and especially abundant in Porto Rico. It was inadvertently and erroneously referred to *Gouldia* in the report on the Blake mollusks.

TRANSENNELLA STIMPSONI Dall, 1902.

Cape Hatteras, Egmont Key and south to Key West, in 15 to 31 fathoms.

White, with brown lineation or maculation externally, and orange or deep purple internally, in the central part of the valves. By an accident this species was figured[a] for the following species, which is a smaller and more rostrate shell. *T. stimpsoni* is the largest and prettiest of the genus so far recognized.

TRANSENNELLA CONRADINA Dall, 1883.

St. Andrew Bay, on the north coast of the Gulf of Mexico in western Florida, south to the Florida Keys and north on the east coast of Florida to Palm Beach, near low-water mark.

This peculiarly cuneate species has much the same range of color as *T. stimpsoni*, but is different in form.

TRANSENNELLA CULEBRANA Dall and Simpson, 1901.

Culebra Island, Porto Rico.

A specially trigonal, short form, white inside, and light yellow brown externally.

TIVELA ABACONIS Dall, 1902.

Abaco, Bahamas, and Vera Cruz, Mexico.

Shell small, subtranslucent, of a warm rose color, passing into white distally. It is notable for having only three cardinals in each valve.

TIVELA MACTROIDES Born, 1778.

Bahama Islands and through the West Indies and adjacent continental shores and south to Santa Caterina, Brazil.

This species may be white, or chestnut brown, or with brown rays on a lighter ground. The form is almost as variable as the coloration. The adults appear to have more tumid umbones and a longer and more pointed posterior end than the juvenile specimens. The species is the *Venus corbicula* of Gmelin, 1792; *Tivela vulgaris* of Link, 1807; *Trigona radiata* Megerle, 1811; *Venus turgens* (Solander MS.) Dillwyn, 1817; *Trigona fasciata* Schumacher, 1817, and the *Cytherea corbicula* of Lamarck, 1818.

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[a] Proc. U. S. Nat. Mus., XXIV, pl. xxxi, figs. 5 and 7.

TIVELA (MACTROIDES var.?) NASUTA Dall, 1902.

Santa Marta, Colombia; Baker.

Having the striped color pattern and tints of varieties of *mactroides*, this shell has a very much more elongated form and more delicate hinge. There is nothing in the collection which enables me to bridge the gap between the two.

TIVELA TRIGONELLA Lamarck, 1818.

West Indies, and the Gulf of Paria.

This little oval species appears to be rare. It is the *Trigona angulifera* of Gray, 1838, and perhaps the *Cytherea incerta*, Sowerby, 1851.

TIVELA BRASILIANA Dall, 1902.

West Indies; Santa Caterina, Brazil; Ihering. This form was at first supposed to be *T. bicolor* Gray, but after study it was found to differ, being a heavier and less angular shell, with the dorsal slopes less straight and the pallial sinus shorter and relatively smaller, though the shell attains a greater size than *T. bicolor*. The type is from Brazil; some young specimens from the Antilles appear to be the same.

It is not at all certain that the *T. dillwyni* Deshayes, 1853 (*T. mactroides* Sowerby, 1851), is not, after all, an extreme variety of *mactroides* Born; there is a specimen of *T. bicolor* Gray, in the collection, marked as from Florida, but it is doubtless adventitious.

TIVELA FULMINATA Valenciennes, 1827.

Coast of southern Brazil at Rio and Santa Caterina.

Arcuate, with brownish umbones and more or less zigzag tracery. It has a length, when adult, of 60 mm.

TIVELA (PACHYDESMA) VENTRICOSA Gray, 1838.

Southern coast of Brazil.

This fine species is figured from juvenile specimens in Römer's Monograph, and in all the manuals it is stated to come from China. Dr. von Ihering has repeatedly collected it from the coast of Brazil, and the Chinese habitat is certainly erroneous. One specimen in the United States National Museum measures 105 mm. in length, 90 mm. in height, and 70 mm. in diameter. It is usually white with a dehiscent vernicose periostracum.

TIVELA (EUTIVELA) PERPLEXA Stearns, 1891.

Argentine coast; and off the Rio La Plata, in 10 to 15 fathoms, muddy bottom.

Notable for its crenulated margins and yellowish-white coloration.

TIVELA (EUTIVELA) IHERINGI Dall, 1891.

Sao Paulo and Santa Caterina, Brazil, Ihering.

More delicate and arcuate than the last species, and mottled or banded with purplish brown on a paler ground color, the interior more or less purple.

GAFRARIUM (GOULDIA) CERINA C. B. Adams, 1845.

Cape Hatteras, North Carolina, and southward to Bermuda, the Antilles, and to 90 miles southwest of Cape San Roque, Brazil, from low water to 95 fathoms.

This was first described as *Thetis cerina* by Professor Adams.

GAFRARIUM (GOULDIA) BERMUDENSIS E. A. Smith, 1885.

Bermuda, Barbados, and Curaçao in 5 to 100 fathoms.

More convex, heavy, and more coarsely sculptured than *G. cerina* as a rule, but sometimes varying toward that species, which is also found in Bermuda.

GAFRARIUM (GOULDIA) INSULARIS Dall and Simpson, 1901.

Porto Rico, in 5 to 30 fathoms; also in the Oligocene of Bowden, Jamaica.

Smaller, more inequilateral, and destitute of the lively color painting characteristic of the two species above mentioned. *G. insularis* is of a grayish-white color.

MACROCALLISTA NIMBOSA Solander, 1786.

Beaufort, North Carolina, south to Cuba and west to Mobile on the Gulf coast.

This is *Venus gigantea* of Gmelin, 1792 (after Chemnitz, 1788); *Pectunculus nimbosus* "Humphrey," 1797; *Paphia ala-avis* Bolten, 1798; *Cytherea multiradiata* Menke, 1830; and *Callista* (*Macrocallista*) *gigantea* Meek, 1876.

This is the most showy of American Veneridæ, and the largest of its genus.

MACROCALLISTA (CHIONELLA) MACULATA Linnæus, 1758.

Cape Hatteras, North Carolina, and southward to the shores of the Gulf of Mexico, the Florida Keys, through the Antilles, and to the vicinity of Cape San Roque, Brazil.

It is the *Cardium trigonum* of Martyn, according to Arango.

AMIANTIS (EUCALLISTA) PURPURATA Lamarck, 1818.

Cuba (Arango) and southward to Brazil.

This is *Cytherea lubrica* Deshayes, 1853, but not of Broderip, 1835; and was named *Chione purpurascens* by Gray, 1838. It is not *Venus purpurata* Gmelin, 1792, but is *Venus brasiliensis* var. β of Gmelin.

CALLOCARDIA VESICA Dall, 1886.

Gulf of Mexico to Barbados, in 84 to 175 fathoms.

White and concentrically grooved with isocardia-like beaks. Described as *Cytherea* (*Veneriglossa*) *vesica.*

CALLOCARDIA (AGRIOPOMA) TEXASIANA Dall, 1892.

Coast of Texas from Galveston to Indianola.

Resembles the following species, but is larger, much more elongate, and with a narrower lunule. Described as *Cytherea texasiana.*

CALLOCARDIA (AGRIOPOMA) MORRHUANA Linsley, 1848.

Prince Edward's Island, and southward to the vicinity of Cape Hatteras, North Carolina, in 10 to 107 fathoms.

Rounded trigonal, earthy white, with fine inosculating, concentric wrinkling externally. This species has long been confounded with the fossil *Cytherea convexa* Say, 1824, not of Brongniart, 1811; which name was replaced by Conrad in 1833 by *C. sayana.* Both names have been applied to the present shell, which has also been called *C. sayii* by Perkins, 1869. *C. morrhuana* has lower beaks, a narrower and more delicate hinge plate, and is in general less trigonal than the Miocene fossil. Linsley's name was given to a very young shell, without description, and subsequently identified by Dr. Gould from Linsley's specimens. It has been proposed to use the name *Sayana* for the recent shell, but this is clearly inadmissible, and Conrad himself retained it for the fossil after he decided that the two were not identical.

CALLOCARDIA (AGRIOPOMA) ARESTA Dall and Simpson, 1901.

Porto Rico, in 12 to 30 fathoms.

More porcellanous, inequilateral, and rostrate than the preceding species.

CALLOCARDIA (AGRIOPOMA) ZONATA Dall, 1902.

North Carolina coast near Cape Hatteras, in 18 to 22 fathoms.

Small, trigonal, evenly concentrically grooved and zoned with yellow brown.

PITARIA ALBIDA Gmelin, 1792.

From the Florida Strait through the West Indies and on the northern shores of South America, in 4 to 25 fathoms.

An elongate, squarish, white species, with the anterior end somewhat attenuated, frequently confused with bleached valves of *P. fulminata*.

PITARIA FULMINATA Menke, 1830.

Cape Hatteras, North Carolina, to Bermuda, the Antilles, and Brazil, in depths varying from a few feet to 170 fathoms, the latter locality having afforded living young specimens.

This is supposed by Krebs to be the *Cytherea hebræa* of Lamarck, 1818.

This species appears to be very common in the West Indies. Normally it is white, with radial or zigzag painting of bright yellow brown, under a chalky periostracum. The dead valves, bleached and worn, are frequently taken for *P. albida*. It is the *Cytherea varians* of Hanley, 1844; *C. rubiginosa* Philippi, 1845; but not *C. fulminata* Philippi, 1845, or *Venus fulminata* Valenciennes, 1827. The latter is a *Tivela*.

PITARIA PENISTONI Heilprin, 1889.

Bermuda, and St. Thomas, West Indies.

A small thin oval shell, more or less painted with brown outside and with purple inside.

PITARIA SIMPSONI Dall, 1895.

West coast of Florida, at Tampa and Sarasota bays, low water to 26 fathoms.

Larger, more trigonal, and solid than the last species, but very similarly painted, though it is occasionally pure white. This is a modified descendant of the Tertiary species of *Hyphantosoma*.

PITARIA EUCYMATA Dall, 1889.

Cape Hatteras, North Carolina, and southward to the Antilles and Cape San Roque, Brazil, in 20 to 111 fathoms.

Short oval, inflated, elegantly distantly concentrically grooved, polished, and painted with brown and cream color and internally with rose; this rare species is one of the most elegant and attractive shells of the coast.

PITARIA MUNDA Römer, 1860.

St. Thomas, West Indies.

A young and dubious shell, as yet unfigured.

PITARIA (HYSTEROCONCHA) DIONE Linnæus, 1758.

Texas coast to Costa Rica and Colon; also the Antilles and Trinidad.

This beautiful and well-known shell has been fortunate in escaping with a single specific synonym, *Dione veneris* Deshayes, 1853, the other names which have been cited for it being derived from authors with no standing in binomial nomenclature, unless we except the anonymous *Pectunculus aculeatus* of the Museum Calonnianum, in 1797.

A variety in which the spines are aborted is not uncommon.

PITARIA (LAMELLICONCHA) CIRCINATA Born, 1778.

The Antilles, the northern shores of South America, and southward to Santa Caterina, Brazil.

This shell can hardly be separated from the *P. alternata* Broderip, of the Pacific shores of South and Central America, and has been stated to occur on the west coast of Africa as the *Venus guineënsis* Gmelin, 1792. Other synonyms are *Cardium purpurea* Martyn, 1784, and *Venus rubra* Gmelin, 1792.

CYTHEREA (CYTHEREA) LISTERI Gray, 1838.

From Lake Worth, Florida, and the keys, southward through the Antilles, as far as Tortola and the Virgin Islands.

This has been erroneously identified with *V. reticulata* Linnæus and *V. crispata* Deshayes, 1853, and wrongly referred to the Indo-Pacific fauna by Deshayes. There is a dash of purple under the nymphs.

CYTHEREA (VENTRICOLA) RIGIDA Dillwyn, 1817.

Florida Keys to Rio Janeiro, including the West Indies; also in the Gulf of California.

This well-known shell is the *Venus rugosa* Gmelin, 1792, not of Linnæus, 1771; it is the *Pectunculus rigidus* Solander MS., 1798; *V. cincta* Gmelin, 1792, is probably the young, and Schröter wrongly identified our shell with *Venus casina.*

CYTHEREA (VENTRICOLA) RUGATINA Heilprin, 1886.

Cape Hatteras, North Carolina, the Gulf of Mexico and southeastward to Porto Rico in 26 to 85 fathoms; also fossil in the Florida Pliocene.

Shell resembling *C. rigida*, but with the primary concentric lamellæ more distant and the secondary lamellæ more distinct. The margin below the lunule is produced into a point.

CYTHEREA (VENTRICOLA) STRIGILLINA Dall, 1902.

From Key West, Florida, to Barbados, and 90 miles southeast of Cape San Roque, Brazil, in 20 to 100 fathoms.

Shell entirely white, much smaller than the preceding species, and with very much finer, though similar, sculpture. The lunule is also proportionately larger.

CYTHEREA (VENTRICOLA) CALLIMORPHA Dall, 1902.

Barbados in 76 fathoms; a young shell, perhaps identical, off Cape San Antonio, Cuba, in 300 fathoms.

Shell small, with a rosy flush internally and a yellow brown periostracum over a white disk. This species was identified doubtfully with Reeve's *Venus pilula* in the *Blake* report, but I am now confident that it is distinct. The sculpture resembles that of *C. strigillina*, but is less dense and prominent.

CYCLINELLA TENUIS Recluz, 1852.

Sao Paulo and Rio de Janeiro, Brazil, Guadeloupe, West Indies, Recluz; and northward through the West Indies to Cedar Keys, West Florida.

This was erroneously identified with *C. kroyeri* Philippi, in Poulsen's Catalogue. It is not the *Artemis tenuis* of Sowerby, of slightly later date than *A. tenuis* Recluz; it is smaller and more delicate than the West American species. *Lucinopsis gundlachi* Dunker, in Arango, 1878, is synonymous, and probably the unfigured *C. fragilis* Römer, 1860, from St. Thomas.

CHIONE (CHIONE) CANCELLATA Linnæus, 1767.

From Cape Fear, North Carolina, southward to Brazil, including Bermuda, the West Indies, and the adjacent coasts, in shallow water.

This very abundant and variable shell has naturally received many names, and by the early naturalists was confounded with other cancellated species of Linnæus and others. It is the *Venus dysera* and *ziczac* of various authors, but not of Linnæus; it is *V. cingenda* Dillwyn, 1817; *V. elevata* (and probably *V. inæqualis*) Say, 1822; *V. lamellata* Deshayes, 1853, in synonymy; and *Cardium bicolor* Martyn, 1784. It is the *Venus lamarckii* of Beau, but not of Gray, the *V. ziczac* of Mörch and Krebs, but not of Linnæus; the *V. maculosa* of Gmelin, 1792.

CHIONE (CHIONE) SUBROSTRATA Lamarck, 1818.

Miami, Florida, and the Keys, and south to the Abrolhos Islands, off the Brazilian coast, and Rio Janeiro, in shallow water; also on the shores of the Pacific at Mazatlan, etc.

This is also the *Venus beaui* Recluz, 1852; and *Venus portesiana* Orbigny, 1846. It is the *V. crenifera* of Carpenter in the Mazatlan Catalogue, and Sowerby, 1835; probably also *Venus lunularis* Philippi, 1844 (as of Lamarck), but not of Lamarck, 1818.

CHIONE (CHIONE) MAZYCKII Dall, 1902.

Cape Hatteras, North Carolina, and southward to the vicinity of Cape San Roque, Brazil, in 15 to 127 fathoms.

The bright rose color of the interior and its quadrate form are the most striking characteristics of this small but pretty species. It was cited in Bulletin 37, United States National Museum, as *Venus lamarckii* Gray, the young of which it much resembles, but the latter is an Indo-Chinese species, and has a different hinge.

CHIONE (CHIONE) INTAPURPUREA Conrad, 1849.

Cape Hatteras, North Carolina, and southward to Florida and the Keys and westward on the mainland coast to Texas. Also fossil in the Pliocene of Florida.

This elegant species is the *Venus punctulata* of Conrad, 1843, not of Valenciennes; and the *V. lacunata* Reeve, 1863.

CHIONE (CHIONE) PUBERA Valenciennes, 1827.

West Indies and northern shores of South America. This fine species has been much confused with an East Indian form for which the name of *Cytherea crenata* Gmelin, 1792,[a] should be retained. The present species is a *Chione*, and is the *Venus crenulata* of Sowerby, 1853, and Reeve, 1863, but not of Dillwyn, 1817, or Deshayes (ex parte), 1853. A young specimen with the valves somewhat worn is figured on Plate 267 of the Encyclopédie Méthodique (figs. 4, 4a), and to this in the explanation of these plates by Bory St. Vincent, in 1827, page 152, is attached the name of *Venus pubera* Valenciennes. To figs. 3 and 3a is given the name of *Venus punctata* Valenciennes, but it is not the *Venus punctata* of Linnæus. Conrad, in 1843, cited fig. 4 as *Venus punctulata* Valenciennes,[b] thus committing a double error. Our shell is *Venus eximia* Philippi, 1847, and *V. superba* Guppy, 1875. *V. lacunatus* Reeve, 1863, is probably a young specimen of it.

It is remarkable for its resemblance to the Oriental *Cytherea* referred to, but can at once be distinguished by the absence of the vestigial anterior lateral. *Venus doumeti* Bernardi, 1860, may be a rather short young specimen of this species.

CHIONE (TIMOCLEA) PECTORINA Lamarck, 1818.

The Antilles, and southward to Brazil at Sao Paulo.

It is *Venus elegans* Gray, 1828.

CHIONE (TIMOCLEA) GRANULATA Gmelin, 1792.

Belize, and throughout the West Indies to Brazil.

This is *Venus marica* Born, 1780, but not of Linnæus, 1768; *C. lavacrum* Bolten, 1798; and *Venus plumbea* Reeve, 1864. It is *V. violacea*, and perhaps *V. purpurata*, Gmelin, 1792. Lamarck and Bory St. Vincent have confused numbers of the figures on the plates of the Encyclopédie Méthodique, so that the same figure is made to stand for *V. granulata* Gmelin, *V. cardioides* Lamarck, and *Venericardia radiata* Valenciennes, 1827. *V. cardioides* is probably not an Antillean species, and may be identical with *Tapes histrionica* Sowerby, as well as *Cytherea cardilla* Lamarck.

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[a] *Venus crenulata* Chemnitz, Conch. Cab., VI, 1782, p. 370, pl. XXXVI, fig. 385.

[b] Proc. Acad. Nat. Sci. Phila., I, p. 311.

CHIONE (TIMOCLEA) GRUS Holmes, 1858.

Cape Hatteras, North Carolina, and south and west on the mainland coast to Yucatan, in 12 to 63 fathoms. Also fossil in the Pliocene.

This little shell has been very generally confused with *Venus pygmæa* Lamarck, but it is perfectly distinct. It may perhaps be *V. antillarum* Orbigny, 1853; but this can not be positively determined at this time. It is *Venus parva* Sowerby, 1854, but not of Sowerby, 1829, or Munster, 1836; and it was named *Venus trapezoidalis* by Kurtz in 1860. The animal has two subequal, closely united, fringed siphons, two-fifths as long as the shell.

CHIONE (TIMOCLEA) PYGMÆA Lamarck, 1818.

Florida reefs, and throughout the Antilles.

This little shell was named *Venus inæquivalvis* by Orbigny in 1853. It is of a white color, with brown maculations and a brown spot on the hinge, with coarser sculpture and attaining a larger size than *C. grus*.

CHIONE (LIROPHORA) PAPHIA Linnæus, 1767.

West Indies and southward to the coast of Brazil, in shallow water, and thence to 30 fathoms, usually on a sandy bottom.

This fine and well-known shell is the *Pectunculus vetula* of Da Costa, 1778, but it is not the *Venus paphia* of Pulteney. It is probably the shell listed as *C. affinis* Gmelin, by Poulsen, 1878.

CHIONE (LIROPHORA) LATILIRATA Conrad, 1841.

Cape Hatteras, North Carolina, south to Rio Grande do Sul, Brazil, in 10 to 124 fathoms.

Distinguishable from *C. paphia* by its ribs, which are not pinched off behind and do not bear any elevated expansions. It is *Venus varicosa* Sowerby, 1853, and *V. alveata* Bush, 1885, not of Conrad.

CHIONE (GOMPHINA) KOCHII Philippi, 1843.

A single valve from Belize was collected by the Rev. Mr. Stanton, but it is believed to be derived from ballast, since no living specimens were obtained.

ANOMALOCARDIA BRASILIANA Gmelin, 1792.

Wilmington, North Carolina, and south to the West Indies and to Rio de Janeiro, Brazil.

It is the *Venus flexuosa* Born, 1780, not of Linnæus, 1767; the *V. macrodon* of Hanley, 1843, and Sowerby (fig. 88), 1853; *V. lunularis* Lamarck, 1818; and *Cryptogramma brasiliana* of Römer, 1867. This is the common *Anomalocardia* of the West Indies, a shell very variable in form and color.

ANOMALOCARDIA CUNEIMERIS Conrad, 1845.

From Lake Worth, Florida, and on the shores of the continent south to Cartagena, Colombia. It is not yet authentically reported from the islands of the West Indies.

This is *Venus punctifera* Gray, in Sowerby, 1853; *V. rostrata* Sowerby, 1853, a young shell; *V. flexuosa* Chenu, 1862, but not of Linnæus, 1767, nor Born, 1780. It is *V. macrodon* Reeve, in part. It is smaller, more slender, and more delicate than the *V. macrodon* of Lamarck.

ANOMALOCARDIA LEPTALEA Dall, 1894.

Lagoon at Watling Island, Bahamas. Small, very thin, curiously depauperate from its extraordinarily saline habitat. The inner margins are entire and there is no trace of radial sculpture. The coloration is very variable.

ANOMALOCARDIA MEMBRANULA Römer, 1860

St. Thomas, West Indies; Römer.

Elongate like *A. leptalea*, but with numerous (23) concentric lamellæ, obsolete posteriorly, and of a ferruginous brown, with white specks; the inner margin crenulated. Perhaps a variety of the next species.

ANOMALOCARDIA PUELLA Pfeiffer, 1846.

Punta de Maya, Matanzas Bay, Cuba.

Small, whitish, with radiating brown flecks between concentric lamellæ; internally reddish brown. The lamellæ are persistent and about 13 in number, in a shell 11 mm. long. The inner margin is crenulated. *Venus auberiana* Orbigny, 1853, is probably identical.

VENUS MERCENARIA Linnæus, 1758.

Living from Bay of Chaleurs, Gulf of St. Lawrence, and at Sable Island, southward, locally, to Cape Cod, and thence generally southward to the Florida Keys, westward to the Mississippi Delta, and, sparsely, on the coast of Texas as far west as Corpus Christi Bay. Fossil from the early Miocene to recent times.

This is the *Venus mercenaria* of Spengler, 1785, and subsequent authors; the *V. meretrix* Bolten, 1798, not of Linnæus, 1758; *Mercenaria violacea* Schumacher, 1817; *M. cancellata* Gabb, 1860; *M. antiqua* Verrill, 1875; and *Crassivenus mercenaria* Perkins, 1869.

VENUS MERCENARIA var. NOTATA Say, 1822.

New England to Georgia.

This form is marked by zigzag brown blotches and lines, and is destitute of the purple coloration internally. It is *Venus obliqua* Anton, 1837, and *V. cyprinoides* Anton, 1839.

VENUS MERCENARIA var. CANCELLATA Gabb, 1860.

A rare variety, described from the Miocene, and occasionally found living, in which the medial smooth space of the type is concentrically divided into flat riblets by shallow grooves, the riblets being also radially sulcate.

VENUS MERCENARIA var. RADIATA Dall, 1902.

Similar to the last, except that the smooth medial area is not concentrically sulcate.

VENUS MERCENARIA var. ALBA Dall, 1902.

In this form the interior is like *notata*, and the exterior destitute of colored lineation.

VENUS CAMPECHIENSIS Gmelin, 1792.

Chesapeake Bay and southward to Cuba; westward to Texas and southward to Yucatan, near low-water mark. Fossil from the Miocene to recent faunas.

This is the largest species of the family and the most ponderous, characterized by high inflated beaks, blunt ends, white shell, frequently with zigzag brown lineation in the young externally, and a surface sculpture of dense, low, thin concentric lamellation. The young usually begin in a somewhat quadrate form, with more distant lamellation, without a purple border internally, but sometimes a purple flush in the cavity of the beaks. It passes through a series of mutations analogous to those of *V. mercenaria.*

The young shells about 2 inches or so in diameter have been named *Venus calcarea* by Philippi, 1844; *V. tenuilamellata* Sowerby, 1853, and *V. fulgurans* Tryon, 1865. Gmelin's type was also an adolescent shell. The recent adult has been named *V. præparca* Say, 1822; *V. mortoni* Conrad, 1837, and *V. alboradiata* Sowerby, 1853. To the various mutations exhibited by the species in the fossil state the following names have been given: *V. tetrica* Conrad, 1838; *V. permagna* Conrad, 1838; *V. capax* Conrad, 1844; *V. submortoni* Orbigny, 1852; *Mercenaria obtusa* Conrad, 1866; *M. cuneata* Conrad, 1868, and *M. carolinensis* Conrad, 1875.

VENUS CAMPECHIENSIS var. ALBORADIATA Sowerby, 1853.

Shell with broad brownish rays on a paler ground.

VENUS CAMPECHIENSIS var. QUADRATA Dall, 1902.

Shell small, quadrate, thin, compressed, and unicolorate, usually yellowish white.

VENUS CAMPECHIENSIS var. TEXANA Dall, 1902.

Texas coast.

Shell suborbicular, inflated, with the concentric lamellæ toward the middle of the disk coalescent, forming broad, more or less inosculating, low, flat-topped ribs with polished tops, sometimes showing the brown lineations of the younger stages.

VENUS CAMPECHIENSIS var. TETRICA Conrad, 1838.

Shell with the size and dense surface sculpture of the typical form but the produced trigonal outline of *V. mercenaria.*

VENUS CAMPECHIENSIS var. CUNEATA Conrad, 1868.

Shell subtrigonal, very thick, with very prominent beaks, and very short and blunt, the antithesis of the elongated variety *tetrica.*

VENUS CAMPECHIENSIS var. CAROLINENSIS Conrad, 1875.

Shell much like the normal form but with the lamellæ more or less coalescent in the middle of the disk and not flattened or polished. This occurs living and also in the miocene of North Carolina, from which it was described.

LIOCYMA FLUCTUOSA Gould, 1841.

Arctic, Spitsbergen, and Greenland seas, and the Sea of Okhotsk; southward to the Gulf of St. Lawrence and Nova Scotia, on the Atlantic coast.

The typical form is creamy white. A variety *brunnea*, of rich chestnut or yellow brown, is noted from the Gulf of St. Lawrence. It is the *Venus astartoides* (Beck MS.) Philippi, 1849, but not of D'Archiac, 1847. *Tapes arctica* Reeve, 1864, from the "Arctic Seas," though not this species, may belong to this group.

GEMMA GEMMA Totten, 1834.

Labrador to Woods Hole, Massachusetts; New York Bay?

Flattish and irregularly rippled concentrically. The type is more or less purple, varying to pure white, which forms the variety *Manhattanensis* Prime, 1862. The species is *Gemma totteni* Stimpson, 1860, and *Tottenia gemma* Perkins, 1869.

GEMMA (GEMMA var.?) PURPUREA H. C. Lea, 1842.

Cape Cod to the Bahamas and Texas.

More inflated, trigonal, and with uniform concentric threads sharply defined. It is *Gemma concentrica* Dall, 1889. The color is variable, but usually paler than *G. totteni.*

PARASTARTE TRIQUETRA Conrad, 1845.

From Hillsboro Inlet, on the east coast of Florida, south to the Keys, and on the west coast north to Cedar Keys. Also fossil in the Pliocene.

Small, polished, very elevated, purple and white. Though much resembling *Gemma*, it can easily be discriminated by its smooth and more elevated shell.

NOTES ON AND DESCRIPTIONS OF EAST AMERICAN SPECIES.

DOSINIA (DOSINIDIA) ELEGANS Conrad.

Plate XII, fig. 6; Plate XIII, fig. 7.

Owing to the confusion that has involved this species a figure of it was thought to be desirable.

The figured shell is from Florida. Cat. No. 6120, U.S.N.M.

DOSINIA (DOSINIDIA) DISCUS Reeve.

Plate XII, fig. 1; Plate XIII, fig. 1.

No good figure of this species being available in any recent American publication, one is now supplied. The specimen is from South Carolina. Cat. No. 54094, U.S.N.M.

TRANSENNELLA CONRADINA Dall.

Plate XIII, fig. 5.

Cytherea (*Transennella*) *conradina* Dall, Proc. U. S. Nat. Mus., VI, 1883, p. 340.

A figure drawn from a specimen of *T. stimpsoni* Dall, as noted below, was inadvertently published under this name, so I now give a figure taken from one of the typical specimens. Cat. No. 64437, U.S.N.M.

TRANSENNELLA CUBANIANA Orbigny.

Plate XIII, fig. 4.

Venus cubaniana Orbigny, Moll. Cubana (Sagra), II, 1853, p. 278, pl. xxvi, figs. 44–46.

An enlarged figure of this species is given, which shows a few brown flecks dorsally, though this species is usually pure white. It is from Florida. Cat. No. 54135, U.S.N.M.

TRANSENNELLA STIMPSONI, new species.

Meretrix conradina Dall, Proc. U. S. Nat. Mus., XXIV, pl. xxxi, figs. 5, 7.

Shell small, rounded trigonal, rather plump, polished, painted with purple-brown on a white ground externally, the lunule, and central portion of the disk internally usually purplish; beaks prominent, incurved, small; lunule defined by a sulcus, elongate, narrow; escutcheon not defined; beaks five-fourteenths of the length from the anterior end, which is rounded, with the dorsal slope rather flat; posterior end attenuated; hinge normal, the posterior left cardinal obscure, thin, consolidated with the nymph; internal margins tangentially sulcate; pallial sinus deep, narrow, somewhat rounded in front. Length 14; height 10.5; diameter 7 mm.

Type locality.—Egmont Key, Florida. Cat. No. 54100, U.S.N.M.

The shell is marked by fine concentric lines of growth, and by a few, irregularly distributed, stronger concentric sulci, which become evanescent toward the middle of the disk.

TIVELA ABACONIS, new species.

Plate XIII, fig. 3.

Shell small, subtranslucent, deep rose color at the beaks and in the middle of the disk, becoming paler toward the margins; beaks high, pointed, subcentral; shell moderately inflated, the ends rounded, the base gently arcuate; surface polished; hinge delicate; the teeth small, three cardinals in each valve, the anterior lateral elongate, thin, distant; pallial sinus short, wide, rounded; length, 11; height, 8.2; diameter, 6 mm.

Type locality.—Abaco, Bahamas, I. Greegor. Cat. No. 103551, U.S.N.M.

The shell is smaller, more delicate, more equilateral, and of a different color and texture from *T. trigonella* Lamarck, which is the only species comparable with it and which is white and opaque with a conspicuous periostracum.

TIVELA NASUTA, new species.

Plate XII, fig. 2.

Shell of moderate size, solid, nearly equilateral, somewhat rudely concentrically striated, with a reddish-brown polished periostracum; shell substance white, with numerous pale purple radii, the dorsal posterior margin near the end dark brown within and without; beaks pointed, dorsal slopes nearly straight; lunule impressed, defined by a distinct incised line; anterior end rounded, posterior end narrower, almost rostrate; hinge solid, with four cardinals, the anterior lateral lamelliform, prominent; pallial line with a short, small, rounded sinus. Length, 32.5; height, 25; diameter, 17 mm.

Type locality.—Santa Marta, Colombia; Baker. Cat. No. 153377, U.S.N.M.

By its rudely striated surface and produced posterior end, this seems to differ from the other Antillean forms.

TIVELA BRASILIANA, new species.

Plate XII, fig. 3.

Shell subtriangular, flattish, with high, pointed, opisthogyrate beaks; cream color with darker yellowish zones; surface smooth; lunular region impressed, lunule narrow, elongate, pouting a little at the junction of the valve margins; posterior slope straight, flattened, with a short ligament; interior pale yellow brown; hinge with five right cardinals, the posterior pair rugose; the anterior lateral adjacent, strong; the pallial sinus rounded, about as large as the posterior adductor scar. Length 40; height 34; diameter 20 mm.

Type locality.—Santa Caterina, Brazil. Cat. No. 125468, U.S.N.M.

This peculiarly flat and triangular form recalls the *T. planulata* Sowerby, of the Pacific coast.

CALLOCARDIA (AGRIOPOMA) ZONATA, new species.

Plate XII, fig. 4.

Shell small, thin, arcuate, with a dull surface, whitish with concentric zones of yellow brown; surface concentrically striated or sulcate with wider interspaces, forming low riblets; beaks high, inflated, their apices small, anteriorly directed, lunule large, cordate, defined by a sulcus; no visible escutcheon; ends rounded, base prominently arcuate; interior porcellanous, with a small ascending angular pallial sinus; hinge verging toward *Chionella*. Length 23; height 18.5; diameter 14 mm.

Type locality.—United States Fish Commission station 2608, in 22 fathoms, sand, off the coast of North Carolina. Cat. No 92015, U.S.N.M.

CYTHEREA (VENTRICOLA) STRIGILLINA, new species.

Plate XII, fig. 5.

Shell rotund, inflated, grayish white; beaks prominent, their apices anteriorly directed; lunule deeply impressed, cordate, striated; disk covered with low, uniform, slightly recurved thin primary concentric lamellæ, about 1 millimeter apart, the interspaces with much finer and smaller secondary lamellæ; there is no defined escutcheon, but the posterior dorsal slope, as usual, is less prominently lamellose; hinge strong, with large teeth, the anterior lateral large, and the posterior cardinal on the right valve bifid; pallial sinus very small, wide, and angular; internal margins of the valves finely crenulate. Length 45; height 39; diameter 32 mm.

Type locality.—United States Fish Commission station 2317, in 45 fathoms, coral, off Key West, bottom temperature 75° F. Cat. No. 95668, U.S.N.M.

This species is easily distinguished by its fine close sculpture and pale grayish color from either of the other American species of *Cytherea.* The interior is pure white.

CYTHEREA (VENTRICOLA) CALLIMORPHA, new species.

Plate XIII, fig. 6.

Shell small, globose, covered with a thin yellowish periostracum over a white shell with a salmon-colored flush internally; beaks full, prominent, the apices turned forward; lunule cordate, circumscribed, evenly striated; surface with about 27 primary concentric lamellæ having a T-rail section, the flat interspaces having 6–8 extremely fine low concentric threads, crossed by fine radial striation; escutcheon limited by an obscure ridge, ending in a subangular projection of the margin; in front of the ridge is a wide shallow radial depression; hinge well developed; posterior right cardinal long, distant from the others and bifid; middle right cardinal deeply bifid; anterior lateral small, papilliform; interior surface polished, with a salmon-colored flush behind the beaks; pallial sinus small, sharply angular, ascending; inner margins finely crenate. Length 16; height 14.5; diameter 12 mm.

Station 272, in 76 fathoms, at Barbados, West Indies, United States Coast Survey steamer *Blake.* Cat. No. 64292, U.S.N.M.

The peculiar form of the primary lamellæ renders them very liable to fracture, and if broken off they leave no visible trace, and the surface appears uniformly concentrically threaded, since the basal attachment of the primaries is no wider than the normal width of the secondary threads.

CHIONE MAZYCKII, new species.

Plate XIII, fig. 2.

Shell small, subrostrate, with low distant concentric lamellæ crossing flat radial ribs, those radials in front of the middle later becoming double, while the ribs behind the middle remain single; all the ribs are separated by subequal smooth interspaces except near the anterior margin, where interstitial threads appear; the concentric lamellæ become laminate, especially on the right valve, near the posterior end; lunule distinct, lanceolate, striated; escutcheon defined by a keel, striated, the right half somewhat overlapping the other, painted with brown streaks or entirely brown; disk white with pale-brown or rose-colored radial bands and occasional darker-brown flecks; interior rose color with white near the end and basal margins; hinge normal, with a rose-colored ray below a very short ligament; pallial sinus very small and blunt, inner margins crenulated. Length, 14.2; height, 11.2; diameter, 8 mm.

Type locality.—United States Fish Commission station 2616, off

Cape Fear, North Carolina, in 17 fathoms, sand. Cat. No. 92022, U.S.N.M.

This pretty little species is easily discriminated by its form and color from *C. cancellata* at any stage of growth. It is named in honor of Mr. W. G. Mazyck, of Charleston, South Carolina.

NOTES.

The following *nomina nuda* have been cited in connection with the East American fauna: *Venus lanceata* "Say" and *V. metastriata* "Say," *Venus punctulata* "Valenciennes" and *Cytherea elevata* Conrad, by Conrad, 1846: *Cytherea bella* and *Venus orbicularis* Kurtz, 1860. Names of West American species have been mistakenly applied to those of the east coast, or West American specimens have been wrongfully attributed to eastern localities as follows: *Cytherea pannosa* Sowerby, *Tapes grata* Say, *Venus pulicaria* Broderip, *Chione cingulata* and *Artemis kroyeri* Philippi. *Chione asperrima* Sowerby, and *Callista exspinata* Reeve. Exotic species wrongly given east American habitats are: *Venus crenata* "Chemnitz," *Cytherea affinis* "Gmelin," Sowerby, 1853, *Cytherea kingii* Gray and *C. modesta* Philippi, *Dosinia dilatata* Philippi, *D. lucinalis* Lamarck, *D. cyclas* Römer, and *D. kraussii* Römer.

Species from exotic localities like St. Vincent, Cape Verde Islands, of which the names are repeated in American waters, have been catalogued as from the latter; such are *Dosinia radiata* Reeve and *Venus verrucosa* Linnæus. *Cytherea occulta* Say, 1822, is unfigured and known only by the original description. Most of the names of American *Tivela* have been indiscriminately cited from both coasts, the species being difficult to discriminate and genetically connected. *Venus foveolata* Sowerby, 1853, was described from Martinique, but Deshayes adds to the locality "China." It does not come from both places, but has not been authentically reported from the West Indies since Sowerby's time. Locard, in the report on the Talisman expedition mollusca, reports it from St. Vincent, Cape Verde Islands, in 35 fathoms. *Tapes occidentalis* Reeve, 1864, appears to be identical with a Bombay species, figured on the same plate. It is certainly not West Indian. The ascription of *Venus decorata* Broderip and Sowerby, 1835, by Reeve in 1863, to the West Indies, is erroneous. It is of a strictly oriental type and comes from the Moluccas. I suspect *Venus sallei* Reeve, 1864, of a similar origin, notwithstanding the fact that it is said by Reeve to come from "Bird Island, in the Caribbean Sea." There are a great many "Bird Islands" scattered over the world, and this shell, so far as I may judge from the figure, has an Indo-Pacific aspect.

Dosinia turgida Reeve, 1850, through confusion with *Cyclinella tenuis* Recluz, has erroneously acquired an American habitat.

WEST AMERICAN SPECIES.

DOSINIA (DOSINIDIA) PONDEROSA Gray, 1838.

Payta, Peru, northward to the Gulf of California, and to north latitude 26° 30′ on the west coast of Lower California; in the Pleistocene north to San Pedro, California.

This, the largest and finest of the genus, recalls somewhat the Atlantic *D. concentrica.* It is the *Artemis ponderosa* Gray, 1838, the *Artemis gigantea* Sowerby (in Philippi, 1847), and the *Venus cycloides* Orbigny, 1847. *Artemis distans* Sowerby, 1852, if from Puerto Potrero, Costa Rica, as suggested by Carpenter, may be identical with the young of this species.

DOSINIA (DOSINIDIA) DUNKERI Philippi, 1844.

West Colombia, at Santa Elena; Panama Bay; the Galapagos Islands; and northward to Mazatlan and the head of the Gulf of California; also to Magdalena Bay, on the west coast of Lower California.

This is *Dosinia simplex* Hanley, 1845, not of A. Adams, 1855, and *Cytherea pacifica*, Troschel, 1845, not *Venus pacifica* Dillwyn, 1817.

DOSINIA (DOSINIDIA) ANNÆ Carpenter, 1857.

Mazatlan and the Gulf of California.

This is less tumid, more elongated and smoother than *D. Dunkeri*, and has a more horizontal pallial sinus. The small *D. nanus* Reeve, 1850, was probably based on a very young specimen of this species.

CLEMENTIA SOLIDA Dall, 1902.

Topolobampo, on the west coast of Mexico; collected by E. Daniels.

This is a large and squarish species, with a more solid shell and less degenerate hinge than any of the others heretofore known. It has somewhat the aspect externally of *Saxidomus giganteus.*

TRANSENNELLA TANTILLA Gould, 1853.

Sitka Harbor, Alaska, and southward to Lower California at Todos Santos Bay, in 3 to 16 fathoms; also fossil in the Pleistocene of Santa Barbara, California.

Trigonal, moderately convex, rather elongate; white, with or without zigzag brown painting, usually with the posterior dorsal slope dark purple within and without.

This species is viviparous and was referred by Carpenter to his genus *Psephis* on that account, but has a wholly different hinge. It has been referred to *Venus*, *Trigona*, etc., but on the basal margin has the sulcations of *Transennella*, though less distinct than in the typical species. The Pleistocene specimens were named *Venus rhysomia* by Gabb in 1861.

The more northern specimens are smaller and more oval than those from Santa Barbara, the type locality; and the purple streak is reduced to a more or less distinct flush, which is occasionally wholly absent. These characters, however, seem hardly pronounced enough to deserve a varietal name.

TIVELA PLANULATA Sowerby, 1829.

Gulf of California, Gulf of Tehuantepec, and southward to the coast of Ecuador.

This includes the variety *suffusa* Sowerby, 1835; *Donax lessoni* Deshayes, 1835; *Cytherea undulata* Sowerby, 1851, a color variety; and *C. mactroides* Lamarck, 1818, not of Born, 1778. It is extremely variable in coloration, but maintains fairly well its compressed triangular form.

TIVELA HIANS Philippi, 1851.

Magdalena Bay, Lower California, to Valparaiso, Chile.

This form, described from Mazatlan, is more elongated and rostrate, has a more livid purplish coloration and a very distinct gape behind, by which it is separated from *T. planulata.*

TIVELA ARGENTINA Sowerby, 1835.

West Mexico and south to Panama.

Distinguished by its yellowish-white color, thin shell, and arcuate form attenuated at both ends. It is *Cytherea æquilatera* Deshayes, 1839.

TIVELA ARGUTA Römer, 1864.

Gulf of California to Panama.

Shell small, thin, and oval, recalling *T. trigonella* of the Antilles.

TIVELA GRACILIOR Sowerby, 1851.

Puntarenas, Costa Rica.

This is a species of peculiar form, with fine elevated radial lines anteriorly. It is not the shell figured by Römer under this name.

TIVELA BYRONENSIS Gray, 1838.

Scammon's Lagoon, Lower California and the Gulf of California, and southward to the coast of Ecuador.

This is *T. radiata* Sowerby, 1835, not of Megerle, 1811; *Venus solangensis* Orbigny, 1847; *Cytherea stultorum* Menke, 1847, not of Mawe, 1823; *Cytherea corbicula* Menke, 1847, not of Lamarck, 1818; *Cytherea pulla* Philippi, 1851, and perhaps *C. intermedia* Sowerby, 1851, and *T. elegans* Verrill, 1870. *Trigona humilis* Carpenter, 1857, appears to be the young fry of this species; *T. semifulva* Menke is a nearly white variety, and *T. hindsii* Hanley, 1844, is a striped and latticed color form of the young shell. It is the most common of the Pacific coast species and the analogue of *T. mactroides* of the Antilles.

TIVELA DELESSERTI Deshayes, 1854.

Scammon's Lagoon (young?); Cape St. Lucas, the Gulf region, and south to Acapulco.

This is the *Cytherea nitidula* Sowerby, 1851, not of Lamarck, 1818; the young fry were named *Tivela marginata* by Carpenter, but I do not find that this name has ever been defined in print. It is an elegant polished shell, delicately painted with light purplish brown on a cream-colored ground.

TIVELA (PACHYDESMA) STULTORUM Mawe.

Santa Cruz, California, and south to Ballenas Lagoon, Lower California, and perhaps to Mazatlan.

This is the *Donax stultorum* of Mawe in 1823, but not the *Tivela stultorum* of Menke in 1847; the *Trigonella crassatelloides* Conrad, 1837; *Cytherea solidissima* Philippi, 1851; *C. æquilatera* Römer, 1857, not of Deshayes, 1839; *C. lamarckii*, *C. stultorum*, and *C. crassatelloides* of Reeve in 1864. This is the largest and finest species of the genus, and is well known to most conchologists under the name of *Pachydesma crassatelloides.* A related fossil, *P. inezana*, is said by Conrad to exist in the California Miocene.

MACROCALLISTA (CHIONELLA) SQUALIDA Sowerby, 1835.

Cerros Island, Pacific coast of Lower California, to the Gulf and southward to Peru, in 7 to 27 fathoms.

Chione biradiata Gray, 1838, and *Cytherea chionæa* Menke, 1847, are synonymous. The Philippine *C. elegans* Koch, in Philippi, 1844, has been united with them, but is probably distinct. The species is much like *Macrocallista chione* of Europe, but less attractive. It is the analogue for the Pacific coast of *M. maculata* Linnæus, of the Antilles.

MACROCALLISTA (CHIONELLA) AURANTIACA Sowerby, 1831.

Gulf of California, Cape St. Lucas, and southward to Guayaquil, in 10 to 18 fathoms.

More compressed, redder, and with a dark and dull instead of translucent vernicose periostracum, compared with *M. squalida.* It was first figured and named in Sowerby's Genera of Shells, Part XXXIII, but Hanley's name of *aurantia* given thirteen years later has been more generally used.

MACROCALLISTA (CHIONELLA) PANNOSA Sowerby, 1835.

Cape St. Lucas, the Gulf of California, and southward to Valparaiso, Chile.

This pretty little species is extremely variable in its color pattern. *Cytherea lutea* Koch, in Philippi, 1845, is synonymous.

MACROCALLISTA (CHIONELLA) PUELLA Carpenter, 1864.

Gulf of California and south to Acapulco.

Marvelously like *M. pannosa* in color and form, but always a smaller and thinner shell, with other distinctive characters.

These two species have a great similarity to the Eocene type on which the section *Chionella* was founded.

AMIANTIS CALLOSA Conrad, 1837.

San Pedro, California, to Cape St. Lucas, in shallow water.

This elegantly sculptured, pure white species is well known. *Dione nobilis* Reeve, 1863, is based on a specimen somewhat more rounded than usual.

CALLOCARDIA (AGRIOPOMA) CATHARIA Dall, 1902.

Ballenas Bay, on the Pacific shore of Lower California, to the Gulf of California and southward to the Bay of Panama in 7 to 66 fathoms.

White, somewhat chalky, sharply concentrically striated, with a subcuneate outline and papyraceous periostracum. The analogue of the West Indian *C. aresta* Dall and Simpson, 1901.

PITARIA NEWCOMBIANA Gabb, 1865.

Monterey, California, to Clarion Island and the Gulf of California in 15 to 31 fathoms.

Thin and delicate, with zigzag brown markings and a papery periostracum when fresh.

PITARIA TOMEANA Dall, 1902.

Bay of Panama (Galapagos Islands?), and Tome, Chile, in about 10 fathoms.

The apparent analogue of *P. fulminata* Menke of the Atlantic fauna, but without color painting on the specimens so far obtained.

PITARIA CONSANGUINEA C. B. Adams, 1852.

Panama.

Belongs in the group with *C. albida*, etc., but has radial brown markings and pinkish umbones. I have not seen it.

PITARIA POLLICARIS Carpenter, 1864.

Gulf of California, Cape St. Lucas, and south to Callao, Peru.

A fine, large species, the young with brown painting, the adults mostly polished white. It is *Dione prora*, variety, of Reeve, 1863, but not of Conrad; *Cytherea obliquata* Römer, in part, but not of Hanley, 1844. The true *prora* comes from the Hawaiian Islands.

PITARIA UNICOLOR Sowerby, 1835.

Humboldt Bay, Lower California, and south to Panama.

Somewhat compressed, the concentric sculpture obsolete in the middle of the disk, the color uniform white or brownish. The brown variety is *Chione badia* Gray, 1838, and *Cytherea ligula* Anton, 1839. *Cytherea lubrica* Sowerby, 1835, is perhaps identical. Some specimens are almost rostrate.

PITARIA VULNERATA Broderip, 1835.

Magdalena Bay, on the Pacific shore of Lower California, to the Gulf of California and south to the Bay of Panama.

Remarkable in its violet zones of coloration and for having the inner margins often obscurely crenulate, a feature not known elsewhere in the genus. It is the *Cytherea tricolor* of Pease (MS.) according to Römer, 1867. The young are maculated with brown and the adults sometimes radially lineate with the same color; young specimens of elongate ovate form, which have not assumed the violet rim, have a very different aspect from the mature shell or the normally orbicular young ones.

PITARIA (HYSTEROCONCHA) LUPANARIA Lesson, 1832.

Ballenas Bay, Pacific coast of Lower California, the Gulf of California, and southward to Payta, Peru.

A larger but less elegant analogue of the Antillean *P. dione* Linnæus, easily recognizable by the violet spots at the base of the spines. It appears, as from China, under the name of *Cytherea semilamellosa* Gaudichaud, in the Récueil des Coquilles non figurées of Delessert in 1841. It has also been regarded by several authors as a mere variety of *P. dione*. *Dione exspinata* Reeve, 1863, is a mutation in which the spines are abortive. Northern specimens usually have the concentric sculpture carried evenly across the disk, but in the south a variety is common in which the ribs are obsolete on the posterior half of the disk. The name is frequently misspelled *lupinaria*. It is *Cytherea dronea* Gray, 1833.

PITARIA (LUPANARIA var.) MULTISPINOSA Sowerby, 1851.

Realejo, Central America, and southward to Payta, Peru.

This is a small form in which the concentric sculpture and spines are sharp and crowded, while the coloration is less intense, so that the whole shell is more like *P. dione* than the better developed normal form is. There seems to be insufficient reason for regarding it as a distinct species. The *Cytherea brevispinosa* Sowerby, 1851, seems to have been founded on a single bleached specimen in which the inner row of spines is wanting and the outer row abortive. *Dione brevispinata* and *D. brevispina* Deshayes, 1853, are variants of this name. *Callista longispina* Mörch, is doubtless a mutation of this species.

PITARIA (HYSTEROCONCHA) ROSEA Broderip and Sowerby, 1829.

Gulf of California to Panama.

Reddish brown, flattish, with only hints of spines, which lie in a white streak radiating from the umbo. *Cytherea lepida* Chenu, 1847, is synonymous.

PITARIA (LAMELLICONCHA) CONCINNA Sowerby, 1835.

Magdalena Bay, Pacific coast of Lower California, to the Gulf of California, southward to Panama Bay, the coast of Ecuador and Payta, Peru.

Donaciform or even rostrate, with concentric round-edged ribs, white, with radial streaks of brown; all brown; or all white.

Cytherea affinis Broderip, 1835, and *Venus paytensis* Orbigny, 1847, are synonymous.

C. tortuosa Broderip, 1835, is a white specimen with the ribs more irregular than usual. According to Römer, *C. suppositrix* Menke, 1849, may be this species.

PITRARIA (LAMELLICONCHA) CIRCINATA Born, var. ALTERNATA Broderip, 1835.

Gulf of California to Payta, Peru.

When fully developed this is larger, more convex, and with more distant concentric ribs than any Atlantic specimens I have seen. Immature specimens are often hardly distinguishable. For synonymy see Atlantic list.

The original *alternata* of Broderip was founded on two shells, perhaps distinct from each other. The description was taken from one and the suggestion of the name from the other, which last is represented by Reeve's figure 28*b*, in the Iconica, 1863. Those writers who have had an opportunity to examine Broderip's types agree in referring them to *P. circinata* as a variety; from the figures I should suppose them to be closer to *P. concinna*. Römer, in 1868, figures the second or white form with alternating ribs (pl. XXXVI, fig. 2), which is more like *P. circinata* than the other.

PITARIA (LAMELLICONCHA) CALLICOMATA Dall, 1902.

Bay of Panama, in 7 to 30 fathoms.

White and rather earthy, with primary concentric lamellæ, from one to three secondary smaller lamellæ intervening between each two primaries. It is more elongate, with a longer and narrower lunule than *circinata* and more oval than *alternata*.

CYTHEREA (VENTRICOLA) FORDI Yates, 1890.

Santa Barbara Islands, California, and south to the Gulf of California and to Panama Bay, in 13 to 58 fathoms.

This fine species is near to but quite distinct from *Venus toreuma* Gould[a] a Polynesian species, with which Carpenter doubtfully united it, and by whose name it has passed for some years. It reaches a a length of 65 mm., and is easily recognized by its *Isocardia*-like form, concentric undulations and sharp radial striæ.

CYTHEREA (VENTRICOLA) MAGDALENÆ Dall, 1902.

Off Magdalena Bay, west coast of Lower California, in 36, and in Panama Bay in 18 fathoms.

The analogue of *C. strigillina* Dall, of the Atlantic fauna, but thinner, less inflated, with more delicate sculpture, and pale yellowish coloration spattered with brown flecks.

CYTHEREA (VENTRICOLA) RIGIDA Dillwyn, 1817.

Gulf of California in 9½ fathoms, sand, off the peninsular coast near La Paz. Also in the Atlantic fauna.

The discovery of this well-known Atlantic shell by the United States Fish Commission steamer *Albatross* in the Gulf of California was a surprise; but the specimen, 85 mm. in length, does not seem to differ constantly in any respect from the West Indian shells. The synonymy is summarized in the Atlantic list. It is not *Venus rigida* Gould, 1850. The Pacific shell was named *Venus isocardia* by Verrill in 1870.

CYTHEREA (FOVEOLATA VAR.?) LEPIDOGLYPTA Dall, 1902.

Purchased at Acapulco by W. H. Dall in 1868.

This species has an extraordinary resemblance externally to *Venus campechiensis* of the same size, but it has the hinge of *Cytherea*. It also resembles the figure of *Venus foveolata* Sowerby, 1853, a species referred to both Martinique and China by Deshayes. The raised lamellæ are minutely, transversely, closely striated, but there is no radial interstitial sculpture. The shell is of a yellowish white color. It was purchased with a lot of beach shells, all West American, at Acapulco.

CYTHEREA (CYTHEREA) MULTICOSTATA Sowerby, 1835.

Gulf of California and south to Panama Bay, in moderate depths of water; also at the Galapagos Islands.

Belonging to the group of *C. listeri*, but more oval and with somewhat different sculpture. *Venus thouarsi* Valenciennes, 1846, is probably synonymous. The anterior lateral is usually obsolete in adult specimens, but distinct in the young.

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[a] *Venus toreuma* Gould, July, 1850, from Mangsi Island; + *V. crebrisulca* Sowerby, 1853, and *V. jukesii* Deshayes, 1853, Luzon, and Port Essington, North Australia.

SAXIDOMUS NUTTALLII Conrad, 1837.

Baulinas Bay, California, and south to San Diego.

There are two species of *Saxidomus* on the coast, of which one has brownish markings near the beaks in the young, and a trace of purple internally on the upper posterior margin. The other is all white or yellowish. The present species is rather thin, but reaches a length of 120 mm., and is usually rudely concentrically sulcate. It is the *Venus maxima* Anton, in Philippi, 1846; the *Saxidomus aratus* Gould, 1861, also called by him in the index *S. ovatus* (1862); while the young, with its colored markings, he named *Tapes gracilis* in 1855. Conrad's type was young, 50 mm. long, but his allusion to the color markings settles the identity of the species referred to.

SAXIDOMUS GIGANTEUS Deshayes, 1839.

The Aleutian Islands, from Attu eastward to Kadiak, and southward to the Bay of Monterey, California.

There is no sufficient evidence of the occurrence of this species on the Asiatic coast. It is solid, broad, and heavy; the young are yellowish white; the adult attains a length of 130 mm., and the concentric sculpture is much less pronounced than in *S. nuttallii*. The exterior is sometimes fulvous, but the interior is always white. Specimens which have nestled in rock crevices are usually stunted and distorted. The synonymy has been much confused. It is the *Venus sulcata* of Potiez and Michaud, 1844, but not of Montagu, 1803, or Lamarck, 1818. It was named *Venerupis gigantea* by Deshayes, and has been confounded with *S. squalidus* Deshayes, a South American species, and *S. nuttallii* Conrad.

CYCLINELLA SUBQUADRATA Hanley, 1845.

St. Elena, West Colombia; Panama Bay; Mazatlan, and northward to Guaymas, on the Gulf of California, in 7 to 25 fathoms.

Arthemis saccata Gould, 1851; *Cyclina saccata* Deshayes, 1853; *Artemis tenuis* Sowerby, December, 1852, not of Recluz, June, 1852 (and not *Artemis turgida* Reeve, 1850), are synonymous.

CYCLINELLA KROYERI Philippi, 1847.

Chile and Peru; Salango, West Colombia, in 9 fathoms; and the Gulf of California in 14 to 26 fathoms.

Artemis macilenta Reeve, 1850, appears to be synonymous. It is *Venus kroyeri* Philippi, 1847, but not *Lucinopsis kroyeri* Poulsen, 1878. It is smaller, more orbicular, and proportionately flatter than *C. subquadrata*.

CYCLINELLA PRODUCTA Carpenter, 1856.

Panama Bay, Bridges.

This species, represented by a unique valve in the Cumingian collection, is said to be produced behind like *Cyrena maritima* C. B. Adams.

CYCLINELLA SINGLEYI Dall, 1902.

Guaymas, on the Gulf of California, and at the delta of the Yaqui River near Guaymas, Singley.

This is a moderate sized but turgid species with fine, sharp striation, heavy shell, and the posterior adductor scar very large.

CHIONE (CHIONE) FLUCTIFRAGA Sowerby, 1853.

San Pedro, California, to the Gulf of California and on the shores of the Gulf.

The sculpture of the middle of the disk is strong in youth, obsolete or absent in older stages; some large oblique specimens recall in sculpture *Venus mercenaria.* The species is *Venus callosa* of Sowerby and Deshayes, in 1853, but not *Cytherea callosa* Conrad, 1837; *Dione gibbosula* Deshayes, 1853, and Reeve, 1863, and *Venus cortezi* (Sloat MS. in) Carpenter, 1864, are synonymous.

CHIONE (CHIONE) UNDATELLA Sowerby, 1835.

San Pedro, California, to the Gulf of California and southward to Guayaquil.

A species larger than but varying like *C. cancellata,* with many names; a large series of good specimens leaves no doubt as to the consolidations needed. The characteristics are the generally inflated and closely concentrically lamellose form. The young have the lamellæ more distant, but they are always thin and sharp. The type is painted with angular brown lines like *Venus notata;* young specimens with dark brown blotches are Carpenter's *Venus excavata* of 1856. Specimens without brown painting, adult, and conspicuously lamellose are *V. simillima* Sowerby, 1853. The left half of the escutcheon is usually smooth; the right half may be smooth or lamellose. When coarsely lamellose we have the variety *neglecta* Sowerby, 1839. Carpenter is much confused in his synonymy of these species. *V. nuttallii* Conrad, 1837; *V. entobapta* Jonas, 1845; *V. perdix* Valenciennes, 1846; *V. bilineata* Reeve, 1863; and *V. subrostrata* Reeve, 1863, not of Lamarck, 1818, are synonymous. *V. sugillata* Reeve, 1863, recalls a young acidulated specimen.

CHIONE (CHIONE) SUCCINCTA Valenciennes, 1833.

San Pedro, California, the Gulf of California and south to Panama.

This is another variable species, about which Carpenter fell into confusion. It can be discriminated from *C. undatella* by its coarser and more distant sculpture and the fact that in the adult the ribs of the middle of the lower half of the disk generally are thickened and flattened, showing a polished surface which nearly covers the interspaces. *V. californiana* Conrad, 1837; *V. californiensis* Broderip, 1835; *V. leucodon* Sowerby, 1835; *V. simillima* Carpenter, 1857, not of Sowerby, 1853; and *V. crassa* (Sloat, MS. in) Carpenter, 1864, are synonymous.

CHIONE (CHIONE) COMPTA Broderip, 1835.

Peru and northward to the Gulf of California in 21 to 26 fathoms.

This species has the concentric ribs few and very distant, is relatively flatter than *C. succincta* of the same size, and the pallial line is hardly sinuated and is unusually distant from the ventral margin of the valves. *Venus californica* Carpenter, 1856 and 1872, is this species, the name arising from an error of the types.

CHIONE (CHIONE) SUBROSTRATA Lamarck, 1818.

Mazatlan, Central American coast, and south to Payta, Peru. Also on the Atlantic coast.

This is *Venus crenifera* Sowerby, 1835; *V. portesiana* Orbigny, 1846; *V. beaui* Recluz, 1852; and probably *V. lunularis* Philippi, 1844. Carpenter, in 1863, identified *V. sugillata* Reeve with this species.

CHIONE (CHIONE) PURPURISSATA Dall, 1902.

Cape St. Lucas and the Gulf of California.

This beautiful species, with the interior of the disk rosepurple, was figured by Reeve[a] as a variety of *Venus crenulata* of the West Indies (by which *Chione pubera* Valenciennes is meant), and was named variety *lilacina* by Carpenter, 1864; but it is not *Chione lilacina* Gray, 1838, and so a new name is proposed for it. It is a rounder shell than *C. pubera*, with less prominent lamellation, especially on the posterior slope, which, in this species, is often wholly destitute of lamellæ.

CHIONE (CHIONE) PULICARIA Broderip, 1835.

Gulf of California from its head to Guaymas and south to Chiriqui, West Colombia.

This is *Venus cingulata* Reeve, 1863, not of Lamarck, 1818; and *V. pinacatensis* (Sloat, MS. in) Carpenter, 1864. This species is the Pacific analogue of *C. intapurpurea* Conrad, of the Atlantic fauna, but a more elongated and pointed species.

It is *Venus pfefferi* Dunker, MS., according to Römer, 1867.

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[a] Conch. Iconica, *Venus*, pl. XIII, fig. 46, 1863.

CHIONE (CHIONE) AMATHUSIA Philippi, 1844.

Gulf of California to Panama, in 7 to 24 fathoms.

Perfectly distinct from *C. gnidia*, with which it has been confused. *Venus encausta* is said by Sowerby to be a synonym, but no author is cited for it in the *Thesaurus*. It is smaller, more pyriform, and with much less prominent lamellation and finer radial sculpture.

CHIONE (CHIONE) GNIDIA Broderip and Sowerby, 1829.

Cerros Island, on the Pacific shore of Lower California, the Gulf of California, and south to Panama Bay, in 7 to 24 fathoms.

This is the largest and finest of the genus, reaching a length of 85 mm. It is white inside and, when fully adult, has the crenulated inner margin of the valves brown. I suspect *V. ornatissima* Broderip, 1835, to be founded on a particularly oval and lamellose young shell of this species.

CHIONE (CHIONE) EFFEMINATA Stearns, 1890.

"Panama Bay;" Thomas Bridges.

A small, compressed, closely reticulate species, grayish white externally, wholly purple internally, with the hinge and profile of an *Anomalocardia*, to which group I am tempted to refer it, though it, in some respects, seems closer to *Chione*. It has a very Indo-Pacific aspect.

CHIONE (CHIONE) DARWINI Dunker, 1857.

Mazatlan to Panama (Römer).

Regarded as a variety of *C. gnidia* by Carpenter, 1857, and as a variety of *C. amathusia* by Deshayes, 1853. It is stated to differ by having the ventral faces of the concentric lamellæ polished purple brown, as well as the lunule and escutcheon. I have seen no specimens which agree with the descriptions, and regard it as a doubtfully distinct form and perhaps a variety of *C. subrostrata*. It was described from Dunker's manuscript by Römer, 1857.

CHIONE (LIROPHORA) OBLITERATA Dall, 1902.

Humboldt Bay, Gulf of Panama; Arthur Schott.

This is the analogue of *C. latilirata* Conrad of the Atlantic fauna, from which it differs in having the concentric ribs less elevated and more irregular and the shell more rostrate. The coloration is about the same.

CHIONE (LIROPHORA) KELLETTII Hinds, 1844.

Gulf of California and south to the Bay of Panama in 8 to 50 fathoms.

A remarkable species, in which the concentric ribs (of a yellow-brown color) are smoothly coalescent on the disk, but are expanded as prominent white leaflets at each end of the shell. The nepionic young are white, smooth, globular, with one or two sharp distant concentric lamellæ.

CHIONE (LIROPHORA) MARIÆ Orbigny, 1847.

Gulf of California and south to Guayaquil, in 12 to 50 fathoms.

This analogue of *Chione paphia* has narrow, high, and recurved concentric ribs, with fine radial wrinkles, obsolete in the interspaces, except near the beaks. The closeness and number of the ribs in the young is quite variable. It is quite distinct from *C. paphia.* It is the *Venus cypria* Sowerby, 1835, and *Chione cypria* Deshayes, 1853, but not *Venus cypria* Brocchi, 1814, or Risso, 1826. *Venus discrepans* Sowerby, 1853, should be compared with this species.

CHIONE (LIROPHORA) SCHOTTII Dall, 1902.

Humboldt Bay, Gulf of Panama; Arthur Schott.

Small, white, with close, flat, subconcentric, low ridges, abruptly attenuated or duplex on the posterior dorsal area; the valves rounded below with high beaks. The sculpture, on a small scale, recalls that of *Amiantis callosa.*

CHIONE (TIMOCLEA) ASPERRIMA Sowerby, 1835.

Gulf of California, at La Paz, and southward to Payta, Peru.

This shell is easily confused with *Protothaca grata* Say, from which it may be distinguished by its more rasplike surface, larger lunule, extremely long anterior cardinal, and more cuneate outline. It is yellowish or olive, sometimes maculated with brown. *Venus intersecta* Sowerby, 1852, is said to be a synonym though the figures look more like *C. pectorina.* The dubious Lamarckian name of *cardioides* has also been assigned to this species, but this depends chiefly on guesswork. The *V. pectunculoides* Valenciennes, 1839, is said to be identical.

CHIONE (TIMOCLEA) TUMIDA Sowerby, 1852.

Panama and West Colombia.

This is distinguished from the preceding by its tumid, squarish form, finer and more delicate sculpture, and longer hinge line. It is not the variety *tumida* cited by Carpenter for a Californian *Protothaca.*

CHIONE (TIMOCLEA) COLUMBIENSIS Sowerby, 1835.

Mazatlan to Payta, Peru.

This is remarkable for the strength of its flat ribs and rounded, *Cardium*-like outline. It is not the *Venus dombeyi* or *dombeii* of Lamarck, as was supposed by Deshayes, but it shares with that species the peculiarity of having the concentric sculpture absent over the middle part of the disk. It is generally of a dark mottled brownish color externally, and white or with a faint purple flush internally.

CHIONE (TIMOCLEA) PERTINCTA Dall, 1902.

Galapagos Islands.

This is a remarkable shell, white, with brown flames on the posterior dorsal slope, and a brown lunule; the sculpture almost exclusively of distant narrow sulci, which tend to fail at an anterior space in front of the vertical of the beaks. The inner margin is crenulate and white, and except the cavity under the beaks, the interior is usually of a very dark rich purple. Worn specimens were referred to *Paphia grata* Say, by Stearns in his list of Galapagos shells, in 1893.

ANOMALOCARDIA SUBRUGOSA Sowerby, 1834.

Margarita Island, Lower California, the Gulf of California, and southward to Valparaiso.

This well-known and characteristic form was named *Cytherea subsulcata* by Menke according to Philippi, 1844; and *Venus* (*Triquetra*) *triradiata* Anton, 1839.

ANOMALOCARDIA SUBIMBRICATA Sowerby, 1835.

Cape St. Lucas, the Gulf of California, and south to Panama Bay.

Venus bilineata Reeve, 1863, may perhaps be synonymous. *Chione tumens* Verrill, 1870, is one of the numerous mutations.

VENUS KENNICOTTII Dall, 1871.

Neah Bay, Washington, to Little River, Mendocino County, California.

Shell of a yellowish-white color and apparently very rare. It is finely closely lamellose over the whole surface and the rugose area of the hinge is much smaller than in *V. mercenaria*. The corrugated space is more narrow and delicate than in the Atlantic species, but this area is still further diminished in the Japanese *V. stimpsoni* Gould, the only exotic species of the group, first named *V. orientalis* in MS. according to Carpenter, 1856.

VENUS APODEMA Dall, 1902.

Humboldt Bay, Gulf of Panama, Arthur Schott.

A rounded species with low, wide concentric riblets, radially striated on the umbones and with very feeble crenulation of the inner margins.

MARCIA KENNERLEYI (Carpenter MS.) Reeve, 1863.

Kadiak Island and Port Etches, Prince William Sound, Alaska; and southward to Monterey, California, in 8 to 18 fathoms.

The shell is grayish white, with low, coarse, somewhat irregular concentric ribbing. It has been confused by Gabb with *Venus perlaminosa* Conrad, 1855, a miocene fossil, and another form afterwards called *pertenuis* by Gabb, 1869.

MARCIA RUFA Lamarck, 1818.

Chile, northward to the Gulf of Panama.

This is the *Venus opaca* of Sowerby, 1835, and has the external features (but not the hinge) of *Saxidomus;* there is also a circumscribed lunule. *Venus lithoida* Jonas, 1844, is synonymous and *V. expallescens* Philippi, 1844, is based on the young shell. The striation on the anterior half of the shell varies and may be obsolete. On a smooth specimen Deshayes, in 1853, founded his *Saxidomus squalidus*, a name which has been wrongly applied to a northwest coast species. Jonas stated in his diagnosis that there is no lunule, but his own drawing, given by Philippi, shows it to be present; and in separating Philippi's figure from Jonas's name Deshayes overlooked the fact that both were derived from Jonas himself. He also duplicates the species by entering it as *Chione rufa* in his list.

MARCIA (VENERELLA) SUBDIAPHANA Carpenter, 1865.

Unimak Pass, Alaska, east and south to the Santa Barbara Channel, in 10 to 120 fathoms.

Thin, white with olive gray periostracum; variable in form from trigonal to long ovate. Described by Carpenter under the name of *Clementia*. It reaches a length of 63 mm. and is found in the Pliocene of California.

PAPHIA (PROTOTHACA) GRATA Say, 1831.

From Turtle Bay, on the Pacific shore of Lower California, to Cape St. Lucas, the Gulf of California, and southward to Panama Bay.

This beautiful species revels in color variations, many of which have received names. Thus it is the *Venus discors*, *tricolor*, *fuscolineata*, and *histrionica* of Sowerby in 1835, and was called *staminea* (as of Conrad) by him in 1852. Deshayes referred it to *Chione* and described a *Tapes grata* from the Philippines in 1853, which is a wholly different shell, named *T. deshayesii* by Carpenter in 1864. It was called *Venus muscaria* by Reeve in 1863, but it is not the *Cytherea muscaria* of Lamarck in 1818. *V. pectunculoides* Valenciennes, 1846, may be synonymous. The escutcheon varies from distinct to obsolete, and the species can not be divided on this character. *Tapes fluctuosa* Sowerby, 1853 not of Gould, 1841, is probably a young shell of this species.

PAPHIA (PROTOTHACA STAMINEA Conrad, 1837.

North Japan, Sakhalin, Kamchatka, Bering Island, the Aleutians, and the west coast of America, from the peninsula of Alaska southward to Cape St. Lucas and Socorro Island.

I have seen no specimens of this species from the Pribilof Islands or from south of Socorro Island. The specimens from Panama referred to this species should be united with *P. thaca* Molina, which occurs there abundantly. It is one of the common market clams of California, and is even canned for export.

There are a number of recognizable varieties which will be noted. The typical form is elegantly radially ribbed with fine even riblets, the concentric sculpture inconspicuous, the color yellowish white with pale purplish brown maculations. This variety has been collected at Crescent City, California, and occurs from thence southward to the limits of the range, though the species is not abundant anywhere south of Monterey, California.

Conrad's original specimens came from Santa Barbara and San Diego. Absolute synonyms of the typical form are *Venus mundulus* Reeve, 1863; *Chione straminea* Deshayes, 1853, but not of Sowerby, 1852; and *Venus dispar* and *ampliata* (Gould MS.) in Carpenter, 1857.

PAPHIA STAMINEA var. PETITI Deshayes, 1839.

This is the most common form of the species, the form especially abundant north of the Columbia River. It is larger than the southern variety, of a yellowish, chalky white, or dull gray color, without maculations; and the separation of the sculpture into areas is often well marked.

It was described as *Venerupis* and afterward referred to *Saxidomus* by Deshayes. It is *Venus rigida* Gould, 1850 (not of Dillwyn, 1817), in major part, and *Tapes diversa* Sowerby, 1852.

PAPHIA STAMINEA var. LACINIATA Carpenter, 1864.

Monterey, California, to San Diego.

This extremely elegant variety is evenly reticulated by concentric and radial sculpture, and derives its individuality from the development of small prickles or spines at each intersection. When these spines are worn off it can not be separated from the variety *petiti*, but with them it is unmistakable.

PAPHIA STAMINEA var. RUDERATA Deshayes, 1853.

This form, which is found chiefly in the north, is characterized by the turgidity and prominence of the concentric sculpture, which becomes more conspicuous than the radial ribs. Occasionally the shells are delicate and elegant, but usually specimens of this variety are rude and irregular, coarse and unattractive. It was referred to *Chione* by Deshayes, and sometimes it looks not unlike *Marcia kennerleyi*, which, however, has no radial sculpture.

PAPHIA STAMINEA var. ORBELLA Carpenter, 1864.

This variety comprises those specimens which have nestled in the borings of the large Pholads of the coast, especially at Monterey, and have been obliged to grow into an abnormally swollen and tumid shape. They are usually chalky and of a gray tint. A variety *tumida* (but not *Tapes tumida* Sowerby, 1853) has been proposed by Carpenter, but it does not differ from *orbella* sufficiently to name, though it was renamed *Chione conradi* by Römer in 1867.

PAPHIA STAMINEA var. SULCULOSA Dall, 1902.

San Ignacio lagoon, west shore of Lower California.

This differs from the ordinary forms of the species in having the concentric sculpture obsolete, the ribs fewer and stronger, and behind the middle of the shell separated by equal or even wider unsculptured channels or interspaces. The color is pure white, and the only specimens of this variety I have seen were collected by Henry Hemphill.

PAPHIA (PROTOTHACA) THACA Molina, 1782.

Bay of Panama to Valparaiso, Chile.

When well developed this form is very striking on account of the discrepant sculpture on the different parts of the disk, a feature which exists, more or less distinctly, in all the species of this group. The young are sometimes prettily painted with purple brown. It is a notable species for economic purposes in Chile, where it is largely used for food, and called *taca*. It was first described by Molina as *Chama thaca* and referred to *Venus* by Gmelin. It is the *V. dombeii* Lamarck, 1818; *V. chilensis* Sowerby, 1835; *V. ignobilis* Philippi, 1844; but not *Venus columbiensis* Sowerby, as stated by Deshayes in 1853.

PAPHIA (CALLITHACA) TENERRIMA Carpenter 1856.

Victoria, British Columbia, and south to San Quentin Bay, Lower California.

This magnificent shell is markedly distinct in its characters from, and much larger than any of the other west coast species of the genus. It seems to be rather rare. When Dr. Gould described his *Venus rigida* (not *Venus rigida* Dillwyn, 1817) he included representatives of two species. One of these was *Paphia staminea* Conrad, and the other the present species, which was discriminated by Dr. Carpenter.

LIOCYMA BECKII Dall, 1870.

Plover Bay, Eastern Siberia, near Bering Strait, and southward to Unalaska, eastward to Kadiak and Prince William Sound, in 6 to 60 fathoms. Also North Japan.

Shell subtrigonal, inflated, with yellow or greenish periostracum, and irregular concentric sulci. Length of largest individual, 18.0; diameter, 8.5 mm.

LIOCYMA VIRIDIS Dall, 1871.

Point Barrow, Arctic Ocean, south through Bering Strait and Sea to the Okhotsk Sea, the Aleutian Islands, and eastward to Kadiak Island, Alaska, in 4 to 70 fathoms. Also North Japan.

Shell oval, quite inequilateral, when fresh of an olive-green or rich olive-brown color, bleaching on the beach to cream color, with regular, rather distant concentric sulci; subcompressed, sometime almost rostrate behind. Maximum length, 38.0; diameter, 13.5 mm.

The young are very like the adult *L. fluctuosa* Gould, of the boreal Atlantic, but have a deeper pallial sinus.

LIOCYMA SCAMMONI Dall, 1871.

Port Simpson, British Columbia, Scammon.

Brown, dark, solid, with heavy hinge and strong, prominent ligament. The umbones are more central and the pallial sinus more shallow than in any other species. Maximum length, 24.0; diameter, 11.5 mm.

VENERUPIS LAMELLIFERA Conrad, 1837.

Farallones Islands, off San Francisco Bay, and south to Lower California.

This very irregular species has obsolete radial and often very strong, distant, concentric lamellæ, though under favorable conditions, especially in adolescent specimens, the lamellæ may be thin and sharp. The young are brightly colored, the adults dull and earthy, though toward the southern extreme of its range the shell becomes more porcellanous. It was described as *Venus lamellifera* by Conrad, and *Petricola cordieri* Deshayes, 1839, is synonymous. It has been generally known as *Rupellaria lamellifera*, as determined by Carpenter.

VENERUPIS FOLIACEA Deshayes, 1853.

Cape St. Lucas, the Gulf of California, and southward to Acapulco and the Bay of Panama.

A short and foliaceous species, more or less stained with purple. *Tapes squamosa* Carpenter, 1857, from Mazatlan, is the nepionic young of this species. *Venerupis paupercula* Deshayes, 1853, if really from Mazatlan, is perhaps identical, and *Venus troglodytes* Mörch, 1861, is certainly synonymous.

VENERUPIS OBLONGA Sowerby, 1834.

Bay of Panama to Payta, Peru.

Venerupis fimbriata Sowerby, 1853, is probably synonymous; *V. elliptica* and *V. solida* Sowerby, 1834, belong in the genus *Petricola*, where Sowerby originally placed them, and not in *Venerupis*, to which they were referred by Deshayes. The relations of *V. oblonga* to *V. foliacea* are in need of elucidation.

PSEPHIDIA LORDI Baird, 1863.

Port Etches, Prince William Sound, Alaska, and southward to Catalina Island, California, in 4 to 15 fathoms.

White, pale green, or straw color, quite trigonal and plump, often containing the nepionic young.

PSEPHIDIA OVALIS Dall, 1902.

Pribilof Islands, Bering Sea, the eastern Aleutians, and the main coast eastward and southward to San Diego, California, in 3 to 20 fathoms.

Yellowish white, oval, subcompressed, and attaining a larger size than *P. lordi.*

"*Psephis tellimyalis*" Carpenter, 1864, is the nepionic young of *Petricola*, as determined from the type specimens. The name has often been mistakenly applied to *P. ovalis*, and the latter has also been mistaken for *P. lordi* in the absence of figures or typically named specimens. A species of *Psephidia* quite near to *P. ovalis* occurs in the Pleistocene terraces of Volcano Bay, Yesso, Japan, where specimens were collected by Pumpelly.

GEMMA GEMMA Totten, 1834.

Shores of San Francisco Bay, introduced with "seed" oysters from Chesapeake Bay about 1899.

The form obtained is the variety *purpurea* Lea. For synonymy, etc., see Atlantic list. It is not yet certain that the species is established on the Pacific coast.

NOTES ON AND DESCRIPTIONS OF WEST COAST AMERICAN SPECIES.

The available material for the west coast of South America is so meager that no attempt has been made to include species which do not reach the southern limit of the Panamic fauna near Payta, Peru.

CLEMENTIA SOLIDA, new species.

Plate XIV, fig. 4.

Shell large and solid for the genus, with an obscure ridge extending from near the beaks to the posterior end of the basal margin; umbonal region concentrically undulated and the whole shell concentrically, somewhat irregularly, strongly striated; beaks prominent, small; lunular region deeply impressed, though there is no defined lunule or escutcheon; ligament short, on strong nymphs; three entire cardinal teeth in each valve; inner margins smooth; adductor scars large; pallial sinus narrow, long, obliquely ascending, rather blunt in front. Height, 63; length, 79; diameter, 34 mm.

A single valve of this rather remarkable shell was brought to the United States National Museum from Topolobampo, Mexico, by Professor Daniels. Cat. No. 126352, U.S.N.M.

CALLOCARDIA CATHARIA, new species.

Plate XIV, fig. 3.

Shell large, white, somewhat earthy, with a pale olive periostracum; beaks high, prominent, strongly anteriorly directed over a large cordate lunule delimited by an impressed line; extremities slightly produced, base arcuate; anterior slope short and straight, posterior arched, a shallow sulcus cutting off a narrow raised area on each side of the ligament; surface more or less shining, finely, closely, sharply, concentrically sulcate; the middle of the shell in the early stages smooth or with the sulcations feeble, but in the adult they are uniformly continuous; interior white with a faint salmon flush in the cavity of the beaks; pallial sinus very near the margin, exceptionally wide and shallow, rounded in front; the muscular impressions quite small; hinge well developed, normal. Length, 52; height, 43; diameter, 30 mm.

Bay of Panama, in 30 fathoms, mud, at station 2799, United States Fish Commission steamer *Albatross*. Cat. No. 96368, U.S.N.M.

The species appears to be abundant and always pure white externally. The pallial sinus seems to vary in form; in the younger shells it is relatively narrower and more angular, in the adults shorter and more rounded. These differences are rather surprising, as the form of the pallial sinus in most bivalves is fairly constant.

PITARIA TOMEANA, new species.

Plate XV, fig. 2.

Shell small, yellowish white, rather earthy in texture, smooth except for very fine concentric wrinkles; beaks small, pointed; lunule small, defined by a feebly impressed line; periostracum thin, papyracous; interior white, margins entire, the area within the pallial line earthy, the pallial sinus linguiform, short; hinge normal, solid, the anterior lateral subconical. Length, 23.5; height, 20; diameter, 12 mm.

Brought up with mud on the anchor at Tomé, Chile, by the United States Fish Commission steamer *Albatross*. Cat. No. 109220, U.S.N.M.

This is an inconspicuous little species, which may in some instances develop color markings, though the specimens obtained do not.

PITARIA (LAMELLICONCHA) CALLICOMATA, new species.

Plate XVI, fig. 8.

Shell white, rather earthy, moderately convex, elongate ovate; covered with prominent sharp, thin, concentric lamellæ, every third or fourth of which is higher than the others; near the anterior end the lamellation is somewhat more prominent, as usually the case in this group; there are also some fine concentric wrinkles; lunule small, lanceolate, nearly smooth, impressed; ligament defended on each side by a narrow raised rib; there is no radial sculpture; interior pure white; pallial sinus long, linguiform, upper boundary of it nearly horizontal; internal margins smooth, hinge normal, anterior lateral strong. Length, 47; height, 36; diameter, 22 mm.

Bay of Panama, in 14 fathoms, mud, at station 2801, by the United States Fish Commission steamer *Albatross*. Cat. No. 96388, U.S.N.M.

CYTHEREA (VENTRICOLA) FORDI Yates.

Plate XV, fig. 7.

As the original figures in the Bulletin of the Santa Barbara Society of Natural History are accessible to few students, I have added a figure of a well-grown valve from the collection of the United States National Museum, dredged by me off the north side of Catalina Island in 16 fathoms. Cat. No. 120704, U.S.N.M.

CYTHEREA (VENTRICOLA) MAGDALENÆ, new species.

Plate XV, fig. 6.

Shell thin, inflated, suborbicular, inequilateral, the beaks near the anterior fourth of the length; color yellowish, with radial series of pale brown painting; lunule cordate, striate, flattish, pale brown; escutcheon not defined; sculpture of primary distant and secondary adjacent concentric lamellæ which are pedicillate, their expanded summits coalescent and microscopically radially, closely striate; interior white or yellowish; inner margins minutely crenate; pallial sinus small, angular; hinge strong, anterior lateral distinct in the young, anterior right and posterior left cardinals thin, entire, the others thicker and sulcate or bifid. Length, 42 (to 48); height, 38; diameter, 26 mm.

Dredged by the United States Fish Commission steamer *Albatross* off Magdalena Bay on the west shore of Lower California, at station 2989, in 36 fathoms. Cat. No. 109214, U.S.N.M.

CYTHEREA (FOVEOLATA VAR?) LEPIDOGLYPTA Dall.

Plate XV, figs. 4, 5.

Shell suborbicular, moderately convex, yellowish white, profusely concentrically lamellose; beaks prominent, anteriorly directed; lamellæ on the beaks somewhat alternated, three or four secondary lamellæ appearing between each pair of primary slightly higher ones, but over the greater part of the disk they are uniform and similar, with slightly wavy edges and the ventral face of each lamella very finely closely transversely striated, the bottom of the channels between the ribs without sculpture except lines of growth; lunule large, cordate, circumscribed by an incised line, lamellose, the apposited edges slightly pouting; escutcheon bordered by a sharp keel in the left and a rounded ridge in the right valve; wider and smooth in the left, narrower and more or less lamellose in the right valve, the latter slightly overlapping behind; ligament sunken but not covered; the concentric sculpture slightly more prominent distally; interior white, the margins finely crenulate; the pallial sinus short, wide, angular, reaching forward only to the vertical of the posterior end of the ligament; hinge strong, the posterior pair of right cardinals and the middle left one subsulcate; anterior lateral distinct. Length, 41; height, 36; diameter, 23 mm.

Purchased with a lot of west coast beach shells at Acapulco, Mexico, in 1868, by W. H. Dall. Cat. No. 103286, U.S.N.M.

This looks almost exactly like a young quahog, externally, and the *Cytherea* hinge is a surprise. Only one specimen has been examined. It agrees with dealer's shells which come to me named *foveolata* Sowerby, a species which so far seems positively located only in the Cape Verde Islands.

CYCLINELLA SINGLEYI, new species.

Plate XV, fig. 3.

Shell suborbicular, white, shining, but not polished, covered with fine, sharp concentric striation and marked with obscure obsolete radial lineation; valves convex, slightly flattened on the posterior dorsal slope; beaks small, pointed, slightly anteriorly twisted; lunule lanceolate, defined by an impressed line; ligament long, strong, deeply inset; interior white, earthy, with entire margins and a deep, angular pallial sinus, pointing toward the umbo of the shell. Length, 39; height, 38; diameter, 23 mm.

Collected near the delta of the Yaqui River, West Mexico, by J. A. Singley. Cat. No. 108817, U.S.N.M.

This is a more inflated, more sharply sculptured, and more shining species than any of the others.

CHIONE (LIROPHORA) SCHOTTII, new species.

Plate XVI, fig. 7.

Shell small, white, rounded-trigonal, with high, pointed, slightly recurved beaks; lunule long, lanceolate, narrow; escutcheon, limited by an inconspicuous keel, nearly smooth; sculpture of close-set subconcentric, flattened ribs, separated only by much narrower sulci, and not always in harmony with the incremental lines; these ribs are abruptly attenuated or bifurcate on the posterior dorsal area; there is no trace of any radial sculpture; interior white; pallial sinus small and rather open; internal margins crenate, hinge normal, teeth entire. Length, 14; height, 13; diameter, 8 mm.

Collected by Arthur Schott, at Humboldt Bay, Gulf of Panama. Cat. No. 6226, U.S.N.M.

These specimens are small, and very likely not of full size; they may also be somewhat bleached, but they certainly can not be identified with any of the other species of the coast.

CHIONE (LIROPHORA) OBLITERATA, new species.

Plate XVI, fig. 2.

Shell solid and heavy, subtrigonal, with very posterior beaks; of a pale yellow or yellow-brown color, with faint purplish radial flames or flecks; lunule short cordate, nearly smooth: escutcheon elongate, excavated, smooth; beaks small, anteriorly directed; surface smooth or obsoletely radially striated, sculptured with heavy tumid concentric waves which in the adult become somewhat irregular and sometimes coalescent on the disk, more or less angular and bifid on the posterior dorsal slope; interior yellowish with a flush of purple near the hinge; hinge normal; pallial sinus very short and small, angular, inner margins minutely crenate. Length, 24; height, 18; diameter, 14 mm.

Humboldt Bay, Gulf of Panama, two left valves, Cat. No. 11821 and 6227 U.S.N.M.

This is the analogue of the Atlantic *C. latilirata* Conrad, but differs by well-marked characters from that as well as from the species of the *paphia* or *mariæ* type which have regular ribs. It reaches a length of some 30 mm.

CHIONE (TIMOCLEA) PERTINCTA, new species.

Plate XVI, fig. 9.

Shell solid, ovate or cuneate, white externally, with a flush of pink near the umbones, the small lanceolate lunule dark brown, the posterior dorsal slope with wavy red-brown lines irregularly longitudinal. There is a very narrow striated escutcheon; beaks low, at the anterior third; surface with feeble concentric sculpture not rising into lamellæ; radial sculpture conspicuous, of sulci with the anterior slope steep and short, the other covering the whole interspace to the next posterior sulcus; near the lunule the sulci are close and well marked, then for a short space they are almost absent, after which they extend with rather wide interspaces to the posterior end of the shell; these characters of the sculpture may not be invariable, but in the two best preserved valves are similar; interior with the hinge strong, the middle left cardinal bifid, the pallial sinus short, linguiform, the cavity of the valves except near the beaks and margin stained with very dark purple, the inner margins finely crenulate. Length, 37; height, 28; diameter, 19 mm.

Indefatigable Island of the Galapagos group; a number of worn valves. Cat. No. 102457, U.S.N.M.

The young shells appear to be oval, the only well-preserved adult valve, which is figured, is distinctly cuneate. In general the species is more elongate than the other species of the coast and the sculpture is quite unlike any of the others, the nearest being *C. columbiensis*, which has channeled and regular sulci between flat ribs.

VENUS APODEMA, new species.

Plate XV, fig. 8.

Shell suborbicular, convex, white, concentrically ribbed with narrow, solid, hardly elevated riblets separated by narrower sulci; beaks very anterior, incurved, low, finely radially striated; anterior slope short with a small cordate lunule; posterior slope arcuate, with an elongated area bounded by a rounded ridge which does not interrupt the sculpture; interior white, the margins with fine obscure crenulation; pallial line with a short angular sinus; hinge normal, the corrugated area small and narrow. Height, 43; length, 47; diameter, 28 mm.

Humboldt Bay, Gulf of Panama, Arthur Schott. Cat. No. 6243, U.S.N.M.

A single somewhat worn valve was collected by Schott with numerous other beach shells, which he presented to the National Museum nearly fifty years ago. It has been named and figured, because of the interest attaching to the discovery of this genus in those waters, and because it seems certain that it does not agree with any already known species. It is very probable that the sculpture was considerably sharper when the shell was fresh and the concentric sculpture unworn, but it is evident that the latter never was sharply lamellar as in the Atlantic species.

MARCIA KENNERLEYI Reeve apud Carpenter.

Plate XIV, fig. 1.

A figure of a specimen obtained alive in the harbor at Sitka, Alaska, is included. Cat. No. 23441, U.S.N.M.

A worn valve of this species was collected by me at Carmel Bay, near Monterey, California, in 1866.

PAPHIA (PROTOTHACA) STAMINEA var. SULCULOSA, new species.

Plate XIV, fig. 2.

San Ignacio lagoon, Lower California; Henry Hemphill. Cat. No. 105421, U.S.N.M.

This form, through its modified sculpture, is so different from the ordinary type that it seemed best to figure it. Only with a large series can its relations to the type be fully appreciated.

LIOCYMA BECKII Dall.

Plate XVI, fig. 3.

Liocyma beckii Dall, Proc. Boston Soc. Nat. History, XIII, 1870, p. 257; Am. Journ. Conch., VII, 1871, p. 145, pl. xiv, fig. 7.

Plover Bay, eastern Siberia, at the western entrance of Bering Strait. Cat. No. 163110, U.S.N.M.

LIOCYMA VIRIDIS Dall.

Plate XV, fig. 1.

Liocyma viridis Dall, Am. Journ. Conch., VII, 1871, p. 146, pl. xiv, fig. 8.

Kyska Harbor, Great Kyska Island, in 8 fathoms, sand; W. H. Dall. Cat. No. 160904, U.S.N.M.

LIOCYMA SCAMMONI Dall.

Plate XVI, fig. 1.

Liocyma scammoni Dall, Am. Journ. Conch., 1871, VII, p. 145, pl. xiv, fig. 9.

Port Simpson, British Columbia; Capt. C. M. Scammon. Cat. No. 163121, U.S.N.M.

PSEPHIDIA LORDI Baird.

Plate XVI, figs. 5, 6.

Chione lordi Baird, Proc. Zool. Soc., 1863, p. 69, pl. ii, fig. 10.
Psephis lordi Carpenter, Proc. Acad. Nat. Sci. Phila. for 1865, p. 57.

Lituya Bay, Alaska, in 8 fathoms, sand; W. H. Dall. Cat. No. 163071, U.S.N.M.

The specimen figured is perhaps more trigonal than usual, others are slightly more produced behind.

PSEPHIDIA OVALIS, new species.

Plate XVI, fig. 4.

Shell small, white, polished, oval, subcompressed; surface with obsolete concentric threads near the anterior base, but over most of the disk smooth; beaks small and very low, at about the anterior third of the length; lunule elongated, extremely narrow, nearly as long as the anterior dorsal slope; escutcheon linear or none; interior white, the pallial sinus moderate, pointed; internal margin delicately striated; hinge well developed, like that of *P. lordi*, with three entire cardinals and no anterior lateral tooth. Length, 8.5; height, 6.5; diameter, 3.0 mm.

North side Catalina Island, California, in 16 fathoms gravel and sand; W. H. Dall. Cat. No. 163089, U.S.N.M.

The species is viviparous; some of those taken having as many as thirty young shells in the anal chamber. It is always distinguishable from *Psephis tantilla* (Gould) Carpenter by its hinge and oval form, and from *P. lordi* by its oval outline, compressed valves, and thinner shell. *Psephis tellimyalis* of Carpenter, 1864, is the nepionic young of a species of *Petricola*, and his *Psephis salmonea* bears the same relation to some other bivalve, apparently a species of *Tivela*, not *T. stultorum*.

NOTES.

Dosinia angulosa Philippi, through having the name of the Chinese province of Chi-li, latinized into *chiliense* by Deshayes, has been erroneously supposed to extend its range to South America.

The National Museum contains a valve of *Dosinia prostrata* said to have been dredged in the Gulf of California, but as the collector had also visited and collected on the coasts of China and Japan, I suspect a mixture of labels to be responsible for an obvious error. *Clementia gracillima* Carpenter, 1857, from Mazatlan, is an unidentifiable nepionic shell, less than a tenth of an inch in length.

The genus *Circe* does not occur on the west coast of America; even *Gouldia*, which might be expected, is unknown. Two shells described as *Circe margarita* and *C. subtrigona* by Carpenter, in 1857, from Mazatlan, are nepionic shells, which are so juvenile in their characters as to be impossible of identification at present. We may assume it to be certain that they do not belong to the genus *Circe*. *Circe nummulina* Lamarck, 1818, was listed from Central America by Sir E. Belcher, but his localities were notoriously not dependable. *Cytherea petechialis* Lamarck, 1818, is listed by Carpenter from Mazatlan, having been found among the Reigen shells, but it is certainly exotic, none having appeared from there for half a century. *Saxidomus brevisiphonatus* Carpenter, 1865 (and *Darina declivis* of the same date), have never been collected since they were described from the Vancouver region. I believe them to be exotics which were accidentally mixed with West Coast shells. Specimens supposed to be the *Saxidomus*, sent by West Coast collectors, have invariably proved to be mutations of *S. giganteus*. The name *Saxidomus squalidus*, given to a South American shell, probably a *Marcia*, has been frequently applied to the *S. giganteus*, following an error of Carpenter.

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EXPLANATION OF THE PLATES.

PLATE XII.

EAST AMERICAN VENERIDÆ.

Fig. 1. *Dosinia* (*Dosinidia*) *discus* Say. Cat. No. 54094, U.S.N.M.; South Carolina; length, 70.0 mm.; p. 379.

2. *Tivela nasuta* Dall. Cat. No. 153377, U.S.N.M.; length, 33.0 mm.; Santa Marta, Colombia; p. 380.

3. *Tivela braziliana* Dall. Cat. No. 125468, U.S.N.M.; length, 40 mm.; Brazil; p. 381.

4. *Callocardia* (*Agriopoma*) *zonata* Dall. Cat. No. 92015, U.S.N.M.; length, 22.0 mm.; North Carolina; p. 381.

5. *Cytherea* (*Ventricola*) *strigillina* Dall. Cat. No. 95608, U.S.N.M.; length, 38.0 mm.; Key West, Florida; p. 381.

6. *Dosinia* (*Dosinidia*) *elegans* Conrad. Cat. No. 6120, U.S.N.M.; length, 68.0 mm.; Texas; p. 379.

Plate XIII.

EAST AMERICAN VENERIDÆ.

Fig. 1. *Dosinia* (*Dosinidia*) *discus* Say, interior view. Cat. No. 54094, U.S.N.M.; length, 70 mm.; South Carolina; p. 379.

2. *Chione mazyckii* Dall. Cat. No. 92022, U.S.N.M.; length, 15.0 mm.; North Carolina; p. 382.

3. *Tivela abaconis* Dall. Cat. No. 103551, U.S.N.M.; length, 11.0 mm.; Abaco Island, Bahamas; p. 380.

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5. *Transennella conradina* Dall, interior view, showing characteristic sulcations of the margins. Cat. No. 64437, U.S.N.M.; length, 11.0 mm.; West Florida; p. 379.

6. *Cytherea* (*Ventricola*) *callimorpha* Dall. Cat. No. 64292, U.S.N.M.; length, 15.5 mm.; Barbados; p. 382.

7. *Dosinia* (*Dosinidia*) *elegans* Conrad, interior view. Cat. No. 6120, U.S.N.M.; length, 68.0 mm.; Texas; p. 379.

Plate XIV.

WEST AMERICAN VENERIDÆ.

Fig. 1. *Marcia kennerleyi* Carpenter. Cat. No. 23441, U.S.N.M.; length, 71 mm.; Sitka, Alaska; p. 406.

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3. *Callocardia* (*Agriopoma*) *catharia* Dall. Cat. No. 93638, U.S.N.M.; length, 52.0 mm.; Panama Bay; p. 402.

4. *Clementia solida* Dall. Cat. No. 126352, U.S.N.M.; length, 79.0 mm.; Topolobampo, Mexico; p. 401.

Plate XV.

WEST AMERICAN VENERIDÆ.

Fig. 1. *Liocyma viridis* Dall. Cat. No. 160904, U.S.N.M.; length, 31.0 mm.; Kyska Harbor, Aleutian Islands; p. 407.

2. *Pitaria tomeana* Dall. Cat. No. 109220, U.S.N.M.; length, 24.0 mm.; Tome, Chile; p. 402.

3. *Cyclinella singleyi* Dall. Cat. No. 168817, U.S.N.M.; length, 39.0 mm.; Yaqui River delta, Gulf of California; p. 404.

4. *Cytherea* (*Ventricola*) *foveolata* variety *lepidoglypta* Dall Cat. No. 103286, U.S.N.M.; length, 41.0 mm.; Acapulco, Mexico; p. 403.

5. The same, vertical view, showing lunule and escutcheon.

6. *Cytherea* (*Ventricola*) *magdalenæ* Dall. Cat. No. 109214, U.S.N.M.; length, 42.0 mm.; Magdalena Bay, Lower California; p. 403.

7. *Cytherea* (*Ventricola*) *fordi* Yates. Cat. No. 120704, U.S.N.M.; length, 47.0 mm.; Catalina Island, California; p. 403.

8. *Venus apodema* Dall. Cat. No. 6243, U.S.N.M.; length, 47.0 mm.; exterior view of a somewhat worn specimen from Humboldt Bay, Gulf of Panama; p. 406.

PLATE XVI.

WEST AMERICAN VENERIDÆ.

Fig. 1. *Liocyma scammoni* Dall. Cat. No. 163121, U.S.N.M.; length, 20.5 mm.; Port Simpson, British Columbia; p. 407.

2. *Chione* (*Lirophora*) *obliterata* Dall. Cat. No. 11821, U.S.N.M.; length, 24.0 mm.; Humboldt Bay, Gulf of Panama; p. 405.
3. *Liocyma beckii* Dall. Cat. No. 163110, U.S.N.M.; length, 14.0 mm.; Plover Bay, near Bering Strait, Eastern Siberia; p. 407.
4. *Psephidia ovalis* Dall. Cat. No. 163089, U.S.N.M.; length, 9.0 mm.; Catalina Island, California; p. 407.
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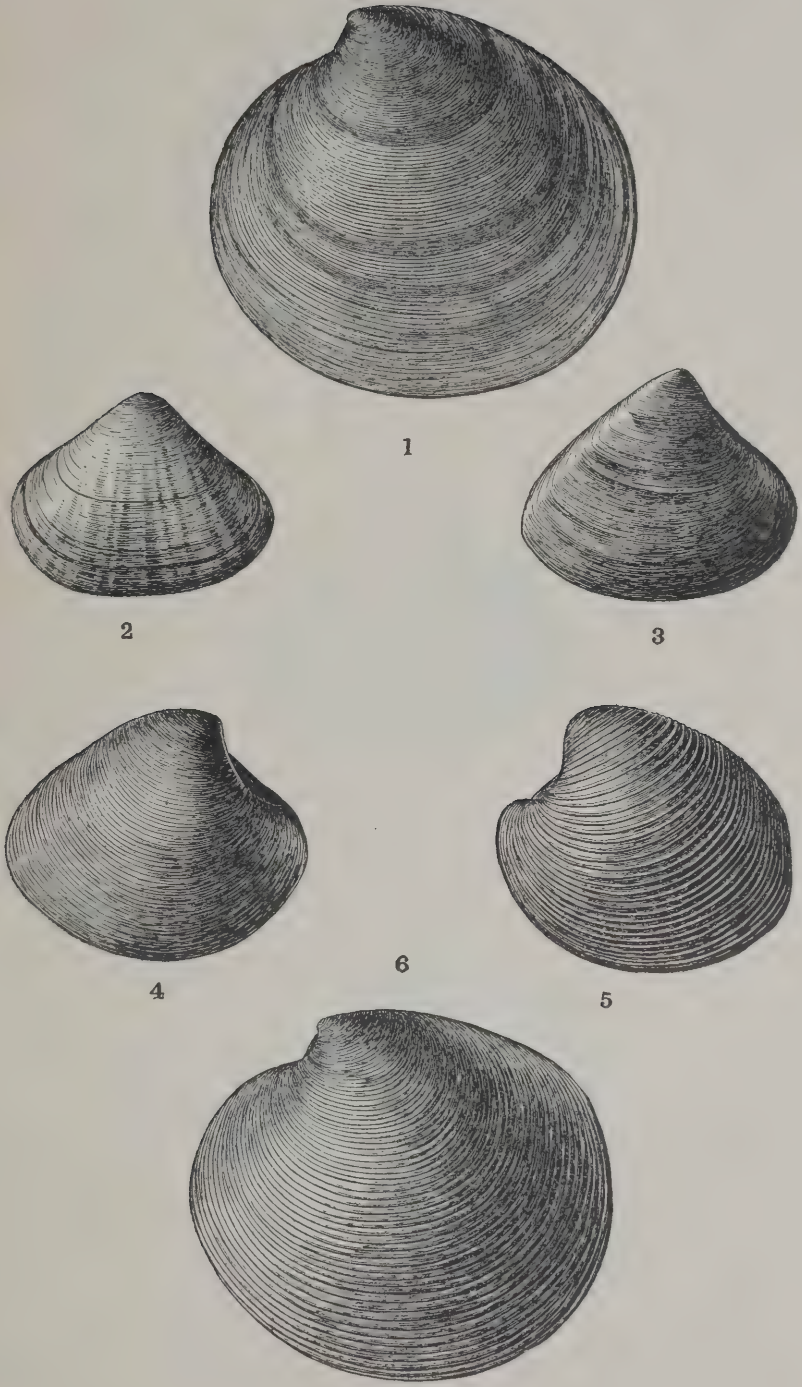
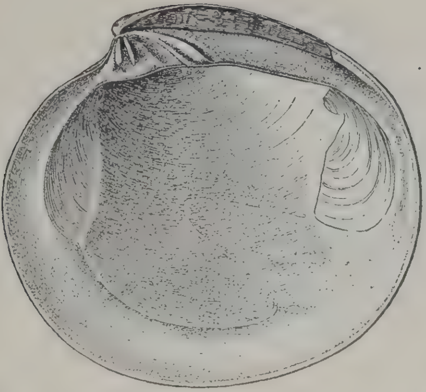
6. The same, umbonal view showing lunule.
7. *Chione* (*Lirophora?*) *schottii* Dall. Cat. No. 6226, U.S.N.M.; length, 14.0 mm.; Humboldt Bay, Gulf of Panama; p. 404.
8. *Pitaria* (*Lamelliconcha*) *callicomata* Dall. Cat. No. 96388, U.S.N.M.; length, 47.0 mm.; Bay of Panama; p. 402.
9. *Chione* (*Timoclea*) *pertincta* Dall. Cat. No. 102457, U.S.N.M.; length, 37.0 mm.; Galapagos Islands; p. 405.



EAST AMERICAN VENERIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 410.



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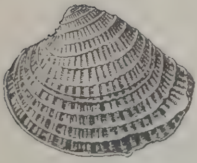

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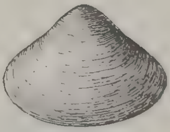

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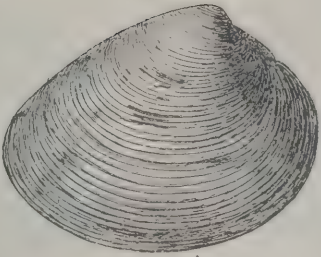

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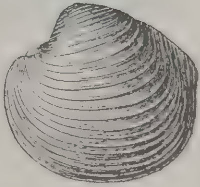

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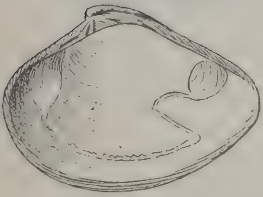

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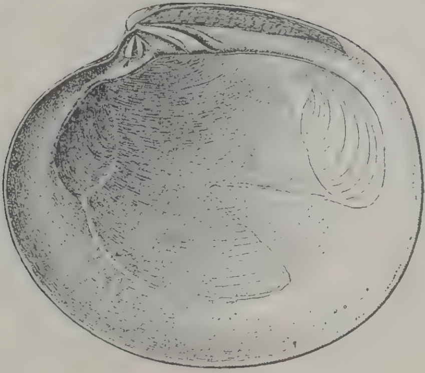

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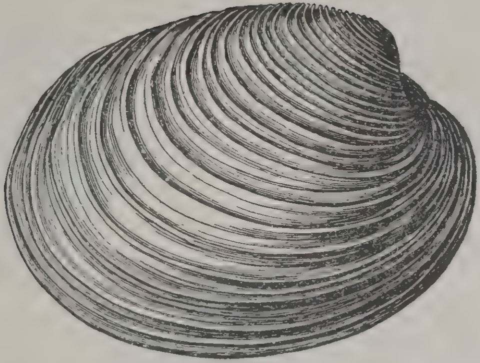
EAST AMERICAN VENERIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 411.



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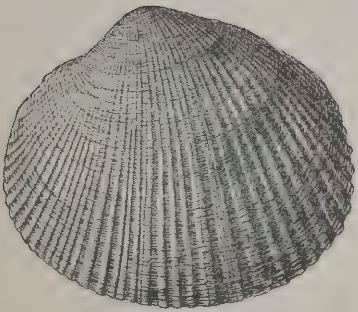

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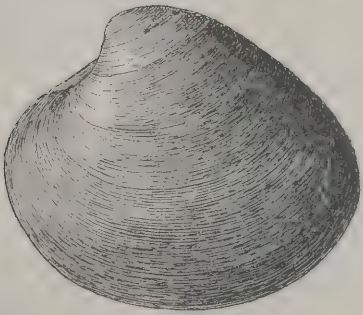

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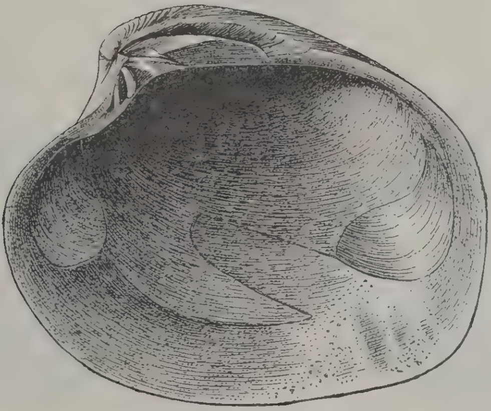
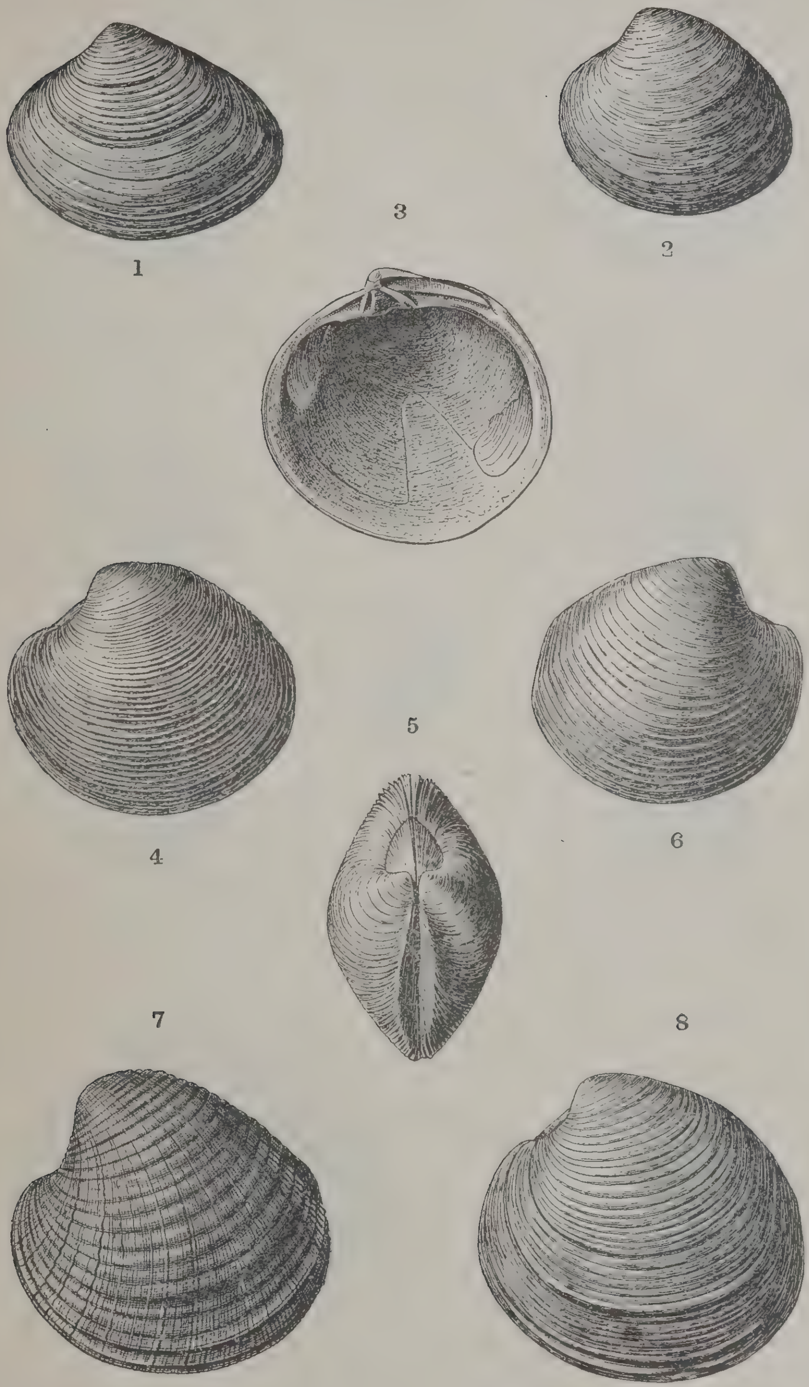


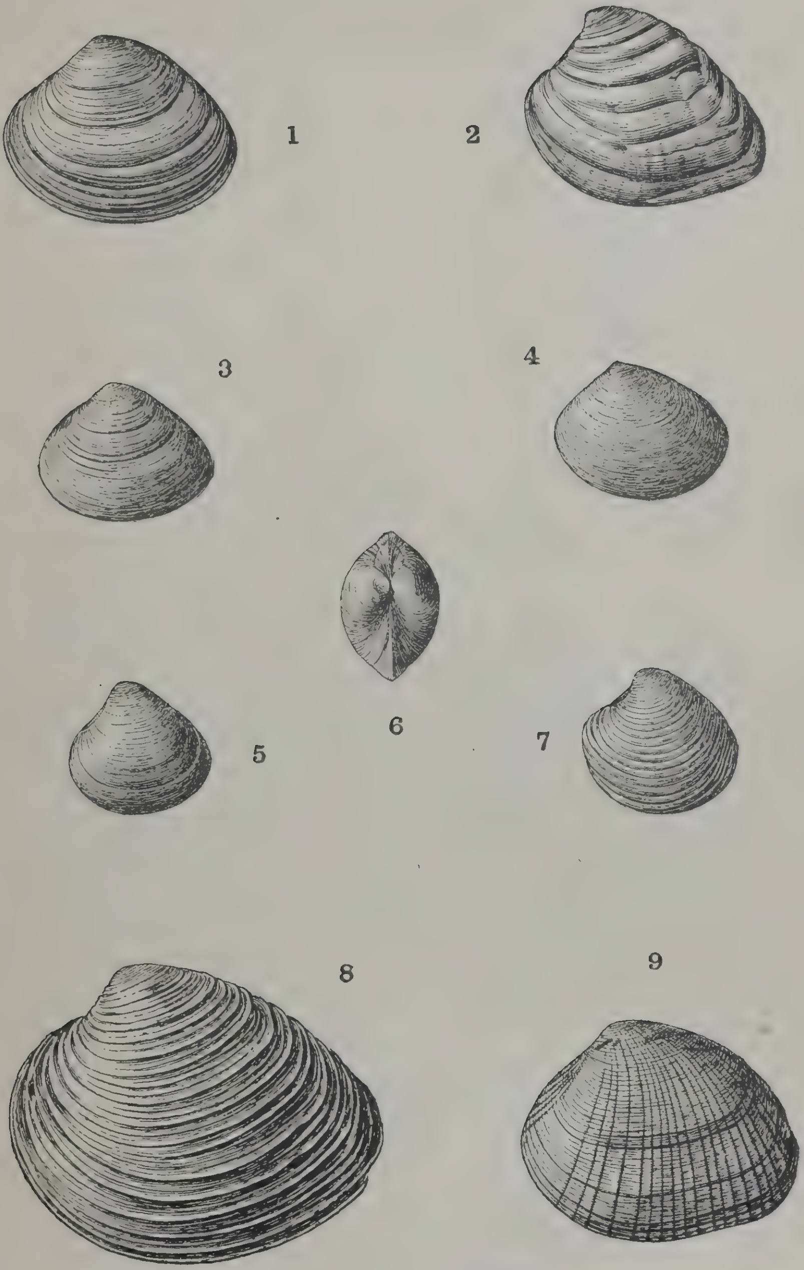
West American Veneridæ.

For explanation of plate see page 411



WEST AMERICAN VENERIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 411



WEST AMERICAN VENERIDÆ.

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SYNOPSIS OF THE LUCINACEA AND OF THE AMERICAN SPECIES.

BY

WILLIAM HEALEY DALL,

Honorary Curator, Division of Mollusks.

From the Proceedings of the United States National Museum, Vol. XXIII, pages 779-833
(with Plates XXXIX-XLII).

[No. 1237.]

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1901.

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Honorary Curator, Division of Mollusks.

The present paper is a continuation of the series of synopses of various groups of our marine bivalve shells, of which the Leptonacea, Solenidæ, Tellinidæ, and Cardiidæ have already appeared in these Proceedings,[1] and other groups have been similarly treated elsewhere.

The Lucinacea is a fairly homogeneous group of families, apparently of very ancient lineage if the Silurian type referred to it is really akin. Mesozoic forms certainly occur, and, in the Tertiary, they are more numerous, more varied, and of greater size than in the recent fauna.

These papers make no attempt to review subordinate groups older than the Tertiary which are not represented in the Tertiary or recent faunas. The older groups require more time and material than is at the writer's disposal to treat them with thoroughness. On the other hand, most of the Tertiary genera are represented in the recent fauna, and some light on their affinities in doubtful cases can be gained from existing types.

The systematic arrangement of the Lucinacea, especially that of the typical family, is exceptionally confused, as it is more than half a century since the group, as such, has been revised even among the recent species, and makers of manuals seem to have accepted current statements with more than usual good nature. Many of the most common species go by names to which a very superficial examination would show they have no sufficient claim, and the manner in which unlike things have been lumped together is quite surprising.

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[1] Synopsis of the Recent and Tertiary Leptonacea of North America and the West Indies. Proc. U. S. Nat. Mus. XXI, pp. 873–897, with plates LXXXVII, LXXXVIII (No. 1177), June, 1899.

Synopsis of the Solenidæ of North America and the Antilles. Proc. U. S. Nat. Mus. XXII, pp 107–112 (No. 1185), October, 1899.

Synopsis of the Family Tellinidæ and of the North American species. Proc. U. S. Nat. Mus. XXIII, pp. 285–326, with plates II–IV (No. 1210), November, 1900.

Synopsis of the Family Cardiidæ and of the North American species. Proc. U. S. Nat. Mus. XXIII, pp. 381–392 (No. 1214), December, 1900.

Most of the older names have been treated with indifference, and the same group has several times received a succession of names from authors who did not investigate the history or literature relating to it.

While it would be too much to expect that the present revision is absolutely free from error, it is believed that it takes a considerable step in advance over anything now published, and will at least direct attention to a very interesting group of Pelecypods.

The families included in the present revision are as follows:

THYASIRIDÆ.

Both coasts; 35 species in all. East coast, 28; west coast, 11.

DIPLODONTIDÆ.

Both coasts; 20 species. East coast, 13; west coast, 9.

LUCINIDÆ.

Both coasts; 63 species.

CORBIDÆ.

Exotic? (Eastern Tertiaries.)

CYRENELLIDÆ.

East coast; 2 species.

All of these except the penultimate are represented in our recent fauna, and all in our Tertiary fauna. There are in all 120 species, of which 81 belong to the Atlantic, 45 to the Pacific, and only 5 (or possibly 6) are common to the two sides of the continent. The relative richness of the Atlantic coast is very marked, but of the Pacific species a large proportion, though not actually identical, are at least closely representative of Atlantic species, and doubtless are derived from a not remote common ancestor. As regards the Tertiary species, it may be said that, while nearly every recent group or species has its fossil analogue, we find as we recede in time, especially in the Eocene, a tendency for the subdivisions to coalesce or at least to lose their distinctive features and exhibit a mutability of character which, from the law of evolution, is exactly what we ought to expect. Contrary to my own anticipations, the superficial and ornamental characters are those which appear to be most strongly conserved from one horizon to another, through a series of geological epochs. Such features frequently come down from the Cretaceous or Lower Eocene with practically no change.

After satisfying myself that there was no mistake in this generalization, I concluded that this might be accounted for on the hypothesis that these characters, mostly due to trifling mutations of the armature of the mantle edge, are so little connected with essentials in the lives of these animals that, having been once acquired, natural selection has little or no influence upon them, and therefore rarely sets up any tendency to change.

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Family THYASIRIDÆ.

(*Cryptodontidæ* of authors.)

Genus THYASIRA Leach.

This is *Thyasira* Leach (in Lamarck, 1818); *Thyatira* Jeffreys, 1839, not Hübner, 1816; *Bequania* Leach (in Brown, 1827); *Axinus* J. Sowerby, 1821, not *Axina* Kirby, 1817; *Cryptodon* Turton, 1822; *Clausina* Jeffreys, 1847, not Brown, 1827; *Ptychina* Philippi, 1836; *Cryptodon*[1] (Turton) Dall, 1889, not of Conrad, 1837; *Schizothærus* Locard, 1898, not of Conrad, 1853; *Philis* Fischer, 1861; *Conchocele* Gabb, 1866; *Megaxinus* Brugnone, 1881; *Axinulus* Verrill and Bush, 1898; *Axinodon* Verrill and Bush, 1898; and *Lucina* (sp.) of various earlier authors.

The genus is divisible as follows:

Section *Thyasira* s. s.

Valves with edentulous hinge, the anterior dorsal area more or less impressed, the posterior more or less distinctly radially sulcate or plicate.

Type, *Tellina flexuosa* Montagu, 1803, + *Venus sinuosa* Donovan, 1801, not of Pennant, 1777; + *Lucina sinuata* Lamarck, 1818; + *Ptychina biplicata* Philippi, 1836; + *Cryptodon bisinuatus* S. Wood, 1840; + *Axinus sinuatus* Philippi, 1845. North Atlantic south to the Azores and Mediterranean.

Philis Fischer, intergrades with the other species. *Megaxinus* Brugnone, differs only by more solid shell and larger nymphs.

Section *Axinulus* Verrill and Bush, 1898.

Shell minute, ovate or oblong, with the dorsal areas obsolete.

These forms intergrade imperceptibly with those of the previous section; *Axinodon* Verrill and Bush, appears to differ by no substantial characters.

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[1] "*Cryptodon*" *moseleyi* and *luzonicus* Smith, do not belong in this family and their place is uncertain.

Genus AXINOPSIS G. O. Sars, 1878.

Valves with one or more cardinal teeth; shell small, solid, with no posterior dorsal area or plication, usually suborbicular.

Type, *A. orbiculatus* Sars, 1878; not *Lucina orbiculata* Montagu, 1808 (as *Venus*); + *Kellia orbicularis* Friele, 1877, not of Searles Wood, 1853.

Genus LEPTAXINUS Verrill and Bush, 1898.

Shell like *Axinulus*, but with distinct lateral teeth.

Type, *L. minutus* Verrill and Bush, 1898.

? Genus LUDOVICIA Cossmann, 1887.

Valves rounded-triangular, subcompressed, edentulous, with minute prominent umbones.

Type, *L. squamula* Cossmann, 1887, Parisian Eocene.

It is possible that further researches may render it advisable to include *Montacuta* in this family.

SPECIES OF THE EAST AMERICAN COAST.

THYASIRA INSIGNIS Verrill and Bush (as Cryptodon), 1898.

Grand Banks of Newfoundland to Cape Cod, Massachusetts, in 65 to 471 fathoms.

Cryptodon Sarsii Verrill, 1880, not of Philippi, 1845, is synonymous.

THYASIRA OVOIDEA Dall (as Cryptodon), 1889.

Off Cape Fear, North Carolina, in 563 fathoms.[1]

THYASIRA GRANDIS Verrill (as Cryptodon), 1885.

From latitude 38° 29′ north, south to Yucatan Straits, on the American coast in 856 to 1,582 fathoms. Also on the coast of France in 820 fathoms.

Cryptodon pyriformis Dall, 1886, and *Schizothærus grandis* Locard, 1896, are synonymous. The application of the name *Schizothærus* to this species by Locard doubtless grew out of a confusion of *Cryptodon* Conrad, 1837 (= *Schizothærus* Conrad, January 31, 1853, = *Tresus* Gray, January 1, 1853) with *Cryptodon* Turton, 1822.

THYASIRA GRANULOSA (Jeffreys as Axinus) Monterosato, 1874.

Gulf of Mexico to Santa Lucia Island, West Indies, in 60 to 116 fathoms. Also Mediterranean, Bay of Biscay, and Canaries, in 49 to 645 fathoms.

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[1] Figured in Proc. U. S. Nat. Mus., XII, pl. xiv, fig. 3.

Axinus orbiculatus Jeffreys, 1881 (not *Axinopsis orbiculatus* Sars, 1878) is synonymous. Its identity with the Sicilian fossil *Verticordia orbiculata*,[1] although claimed by Jeffreys, is very doubtful, and Jeffreys' figures of the sculpture are probably taken from the fossil and not from the recent shell, agreeing much better with the former and not at all with the surface of his types in the U. S. National Museum.

THYASIRA PLICATA Verrill (as Cryptodon), 1885.

Off Marthas Vineyard, Massachusetts, in 1,073 to 1,122 fathoms.

THYASIRA GOULDII Philippi (as Axinus), 1845.

Greenland to Stonington, Connecticut, in 5 to 400 fathoms; also on the west coast of America in Bering Sea, south of Bering Strait, and southward to the Queen Charlotte Islands.

Lucina flexuosa Gould, 1841, but not of Montagu, 1803; and *Thyasira hyalina*[2] Mörch,[3] 1857, are synonymous.

THYASIRA SARSII Philippi (as Axinus), 1845.

Greenland according to Posselt;[4] Norway, Spitsbergen, Iceland; Sars and others.

THYASIRA TRISINUATA d'Orbigny (as Lucina), 1846.

Labrador to Martinique, in 15 to 192 fathoms, North Atlantic, Vigo Bay, and Mediterranean, Jeffreys; also Sitka Harbor, Alaska, in 10 fathoms, and on the coast of Korea, by Captain St. John, R. N.

Axinus flexuosus var. *polygona* Jeffreys,[5] 1863, and *Cryptodon obesus* Verrill, 1872, are synonymous, and perhaps *Lucina flexuosa* of Beau's catalogue of the shells of Guadeloupe.

THYASIRA FUEGIENSIS Dall (as Cryptodon), 1889.

Magellan Strait, in 77 fathoms; also on the west coast of Patagonia, in 449 fathoms.

A large and feebly plicated species, recalling *T. sarsii* Philippi.[6]

THYASIRA PLANA Verrill and Bush (as Cryptodon), 1898.

Halifax, Nova Scotia, to Cape Cod, Massachusetts, in 8 to 100 fathoms.

Approaching the young of *T. sarsii*, but none of the size of adult *sarsii* have been obtained from the American coast south of Greenland.

THYASIRA INÆQUALIS Verrill and Bush (as Axinulus), 1898.

Halifax, Nova Scotia, to Cape Cod, Massachusetts, in 14 to 49 fathoms.

Distinctly plicate behind, and therefore not an *Axinulus*.

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[1] Seguenza, Vert. Plio. Ital., 1876, p. 9.

[2] Beck manuscript, 1847.

[3] In Rink's Greenland.

[4] Consp. Fauna Grönl., 1898, p. 80.

[5] Brit. Conch., II, p. 248.

[6] It is figured in Proc. U. S. Nat. Museum, XII, pl. XIV, fig. 2.

THYASIRA CONIA Dall and Simpson, 1901.

Off San Juan de Porto Rico, in 310 fathoms.

THYASIRA CROULINENSIS Jeffreys (as Clausina), 1847.

West Greenland, in 199 fathoms, Posselt; off Bermuda, in 435 fathoms, Challenger expedition; North Atlantic, Norway to the Azores, in 30 to 1,012 fathoms.

Axinus pusillus M. Sars (manuscript?) is said by G. O. Sars to be synonymous.

THYASIRA EQUALIS Verrill and Bush (as Cryptodon), 1898.

Nova Scotia to Chesapeake Bay, in 94 to 1,537 fathoms.

Cryptodon croulinensis var. *altus* Verrill and Bush, 1898, differs, according to the types, from this species by a longer and straighter anterior slope, but this character is shown by a large series to be inconstant. It occurs in the Gulf of Maine and south to Cape Cod, in 14 to 35 fathoms.

THYASIRA ROTUNDA Jeffreys (as Axinus), 1881.

Abyssal in the North Atlantic, and liable to be found in deep water on the American coast.

Axinus flexuosus var. *rotunda* Jeffreys.[1] This form is near to *T. equalis* Verrill and Bush, but is less truncate behind.

THYASIRA (AXINULUS) BREVIS Verrill and Bush, 1898.

Georges Banks, off Cape Cod, and south to the coast of North Carolina, in 100 to 1,825 fathoms.

Cryptodon obsoletus Verrill and Bush, 1898, is identical with this species, and the differences in the figures, especially as to the position of the ligament, are due to a misconception of the artist and the translucency of the very minute shell.

THYASIRA (AXINULUS) FERRUGINOSA Forbes (as Kellia), 1844.

Arctic seas, North Atlantic south to North Carolina on the west, and the Azores, Mediterranean, Adriatic, and the Morea on the east, in 20 to 1,525 fathoms; also in Bering Sea, Krause.

According to Jeffreys the *Kellia transversa* Forbes (1844, Aegean) and the *Axinus oblongus* Monterosato are the young of this species, which is relatively more transverse than the adult, and the same is probably true of the types of *Cryptodon* (*Axinulus*) *ovatus* Verrill and Bush, 1898, which in addition are abnormally modified by an excessive load of oxide of iron. Specimens purporting to be the same, from station 2113, U. S. Fish Commission, are apparently identical with *T.*

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[1] Proc. Zool. Soc. London, 1881, p. 701.

ferruginosa. The name of this species appears in the Moll. Marins du Roussillon, 1898, page 805, as *Axinus* "*ferrugineus*" Forbes.

THYASIRA (AXINULUS) CYCLADIA S. Wood (as Kellia), 1853.

Baffins Bay, in 1,750 fathoms, Valorous expedition; North Atlantic and Mediterranean, 3,038 fathoms.

Poromya subtrigona Jeffreys, 1858, is identical.

THYASIRA (AXINULUS) EUMYARIA M. Sars (as Axinus), 1870.

Baffins Bay, 1,100 fathoms, Valorous expedition; Norway and Mediterranean, in 200 to 1,456 fathoms.

THYASIRA (AXINULUS) SUCCISA Jeffreys (as Axinus), 1876.

Off Fernandina, Florida, in 294 fathoms; North Atlantic, 92 to 1,366 fathoms; Mediterranean, 40 to 120 fathoms.

This is perfectly distinct from *Axinus incrassatus* Jeffreys, 1876 (=*Leptaxinus* sp.) of which Jeffreys regarded it as a variety.

THYASIRA (AXINULUS) ELLIPTICA Verrill and Bush, 1898.

Off Marthas Vineyard, Massachusetts, in 1,451 fathoms.

This is *Axinodon ellipticus* Verrill and Bush, a species near *T. cycladia* S. Wood, but more rounded behind. The resilium is thicker and expanded behind on its ventral aspect, but is not internal in the strict sense of being occluded by the shell dorsally. A microscopic nodulation under the beaks does not seem to differ, except in being much smaller, from the occasional nodulations frequently found in typical *Thyasira* in the same region. Only one specimen is known, and the evidence seems quite insufficient to separate it from *Axinulus* as yet.

? THYASIRA (AXINULUS) SIMPLEX Verrill and Bush, 1898.

Casco Bay, Maine, to Marthas Vineyard, Massachusetts, in 349 fathoms.

This has the aspect of a nepionic shell and may even not belong to this family.

? THYASIRA (AXINULUS) PYGMÆA Verrill and Bush, 1898.

Halifax, Nova Scotia, to Marthas Vineyard, Massachusetts, in 206 to 499 fathoms.

Possibly the young of *ferruginosa.* At all events, it has the appearance of a nepionic shell and requires confirmation to rank as a species.

? THYASIRA (AXINULUS?) species indeterminate.

Off Bermuda, in 450 fathoms, Challenger expedition.

An undetermined species, reported by E. A. Smith in his report on the Challenger Pelecypoda, page 195, 1885.

AXINOPSIS ORBICULATUS G. O. Sars, 1878.

Greenland and Cumberland Sound, south to Casco Bay, Maine, 10 to 30 fathoms; Arctic Ocean and northern Norway, 8 to 120 fathoms, but not on the Pacific side.

A variety *inæqualis* Verrill and Bush, 1898, found in 18 to 26 fathoms from the Bay of Fundy to Cape Ann; is more quadrate, less orbicular, and all the specimens examined are smaller than the adult *A. orbiculatus*. A large proportion of all those dredged by the U. S. Fish Commission, when compared with those from the high north, appear to be immature. The forms referred to this species from the Pacific coast as far as examined all belong to other species of the genus.

AXINOPSIS CORDATA Verrill and Bush, 1898.

Marthas Vineyard to Cape Hatteras, North Carolina, in 43 to 202 fathoms.

Extremely close to those Thyasiras which have the proximal end of the indented anterior hinge line slightly thickened.

LEPTAXINUS MINUTUS Verrill and Bush, 1898.

Off Marthas Vineyard, in 100 fathoms; easily identified by the distinct lateral laminæ.

LEPTAXINUS INCRASSATUS Jeffreys (as Axinus), 1876.

Baffins Bay and North Atlantic, in 1,480 to 1,785 fathoms; north of Ireland, in 1,180 fathoms. A variety (?) off Culebra Island, West Indies, in 390 fathoms, Challenger expedition.

Jeffreys's original type is figured as exhibiting denticulations which probably belong to a provinculum. His specimens in the U. S. National Museum do not show it, but are evidently referable to *Leptaxinus*. His variety *succisa*, however, is a distinct species of *Axinulus*.

NOTE.—The shell described by Reeve in 1850 as *Lucina barbata* was doubtfully referred to *Cryptodon* by E. A. Smith, in his report on the Challenger bivalves. That gentleman now thinks this identification questionable, as it was founded on a single imperfect valve which may find a place in *Lucina*, properly so called. Both shells are probably true Lucinas and the Challenger valve may be a drifted young specimen of *L. philippiana* Reeve.

SPECIES OF THE PACIFIC COAST OF AMERICA.

THYASIRA BISECTA Conrad (as Venus), 1849.

Gulf of Alaska and Puget Sound, in 69 to 135 fathoms. Also in the later Tertiaries of California as far south as San Pedro.

This is *Cyprina bisecta* Conrad, 1865, and *Conchocele disjuncta* Gabb, 1866. It is the largest species of the genus, measuring up to 80 mm.

in extreme length, but shows absolutely no characters which might separate it from its smaller congeners. It was first described from the Miocene of Astoria; later turned up in the Pliocene of San Pedro (not the Post-Pliocene, as stated by Gabb) and lastly was dredged by the U. S. Fish Commission and the Young Naturalists' Society of Seattle, in Puget Sound.[1]

THYASIRA GOULDII Philippi (as Axinus), 1845.

Metchigme Bay, Bering Strait, south to Sitka Harbor, the Queen Charlotte Islands, and Puget Sound, in 8 to 111 fathoms. Also on the Atlantic coast and in the Pliocene of San Pedro, California, at Dead Mans Island; Arnold.

See the Atlantic list for further data.

THYASIRA TRISINUATA d'Orbigny (as Lucina), 1845.

Sitka Harbor, 10 fathoms; also on the Atlantic coast and the coast of Korea.

See the Atlantic list for further data.

THYASIRA BARBARENSIS Dall (as Cryptodon), 1889.

Coast of Washington, south to the Gulf of California, in 16 to 559 fathoms.

Recalling *T. sarsii*, but differently proportioned. The specimens named *Axinus flexuosus* by Cooper, from 120 fathoms, near Catalina Island, California, prove to belong to this species.[2]

THYASIRA EXCAVATA Dall, 1901.

Oregon to the Gulf of California in 66 to 1,005 fathoms.

A well-marked species notable for the sharp fluting of the posterior dorsal area. See notes and descriptions.

THYASIRA TOMEANA Dall, 1901.

Tomé, Chile, in 10 fathoms. See notes and descriptions.

THYASIRA MAGELLANICA Dall, 1901.

West coast of Patagonia in 194 to 348 fathoms. See notes and descriptions.

THYASIRA FUEGIENSIS Dall (as Cryptodon), 1889.

West coast of Patagonia and in Magellan Strait in 77 to 449 fathoms. See the Atlantic list for other data.

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[1] It is figured in Proc. U. S. Nat. Museum, XVII, 1895, pl. xxvi, figs. 2 and 5.

[2] It is figured in Proc. U. S. Nat. Museum, XII, 1889, pl. viii, fig. 9.

THYASIRA (AXINULUS) FERRUGINOSA Forbes (as Kellia), 1844.

Aleutian Islands in 60 fathoms; Krause.

See the Atlantic list for further data.

AXINOPSIS VIRIDIS Dall, 1901.

Plover Bay, Bering Strait, southward to Catalina Island, California, on the east, and to northern Japan (Capt. St. John, R. N.) on the west, in 5 to 167 fathoms.

A silky green, solid, orbicular species with very distinctly developed cardinal teeth. See notes and descriptions.

AXINOPSIS SERICATUS Carpenter (as Cryptodon), 1864.

Kyska Island, Aleutians, south to Puget Sound and Catalina Island, California, in 2 to 120 fathoms.

More ovate, flatter and thinner, with a less developed dentition and pale yellow periostracum. The name was misprinted *serricatus* in the British Association Report of 1863. See notes and descriptions.

Family DIPLODONTIDÆ Dall.

This family is composed of Lucinoid shells, in which the external limb of the gills is developed, reflected, and sometimes appendiculate, the adductor scars not projecting into the disks of the mantle, the hinge with the laterals obscure or absent, the valve margins plain, the shell suborbicular in outline, rarely nestling and irregular. The foot is elongated, cordlike, and more or less distally clavate in the typical forms, but may be nearly normal in the estuarine *Joannisiella*, affording a parallel to *Jagonia* in the *Lucinidæ*. Thoughout the family the dental formula is $\frac{\mathrm{L}\ 0.1010.0}{\mathrm{R}\ 0.0101.0}$, the central cardinals being usually bifid.

The fossil genus *Sphæriola* has much the appearance externally of *Diplodonta*, but the shell is heavy, and the hinge edentulous, and its relations to this family remain to be made out. The genus *Taras* Risso, from the figure and description,[1] would seem to be a *Diplodonta*, in which the delicate posterior cardinal of the left valve had been broken away and the corresponding tooth of the right valve mistaken for an adjacent lateral. It was founded on *T. antiquatus* Risso, a fossil of La Trinité (Tertiary). If this identification proves correct, the name *Taras* will supersede *Diplodonta*, being five years earlier in date. It was placed next to *Loripes* by Risso. I do not make the substitution, hoping that some Italian naturalist may be able to examine Risso's type species, and thus arrive at certainty before upsetting an old and familiar name.

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[1] Hist. Nat. Eur. Mér., IV, 1826, p. 344, pl. XII, fig. 167.

The family comprises the following genera:

DIPLODONTA Bronn, 1831.

Type, *Venus lupinus* Brocchi.

UNGULINA Daudin, 1802.

Type, *U. rubra* Roissy.

FELANIA Recluz, 1851.

Type, *Venus diaphana* Gmelin.

JOANNISIELLA Dall, 1895.

Type, *Cyrenella oblonga* Sowerby.

Of these genera only *Diplodonta* is represented in American waters, as far as yet known, and it is divisible into the following groups:

Section *Diplodonta* s. s. Type, *D. lupinus* Brocchi.

Section *Felaniella* Dall, 1899. Type, *Felania usta* Gould.

Shell like *Diplodonta*, but heavy, compressed, smooth externally, with a conspicuous usually dark periostracum and less equilateral valves.

This group exists well developed in the Eocene. The species called *Felania* by Carpenter, from American waters, are included in it. The type is from Japan.

Section *Phlyctiderma* Dall, 1899. Type, *Diplodonta semiaspera* Philippi.

Shell like Diplodonta, except that the surface, in addition to incremental sculpture, is punctate, pustulate or subreticulate. The type is from Cuba, but the group is world wide.

Section *Sphærella* Conrad, 1838. Type, *S. subvexa* Conrad= *Erycina subconvexa* d'Orbigny 1852, not *Lucina subvexa* Conrad, 1848.

Shell large, concentrically striate, an impressed line above the anterior cardinal, suggesting a minute lunule; the right posterior cardinal wide, undulated above, the posterior adductor scar distant from the hinge plate. The type is Miocene, and there is one recent species known from the Atlantic coast; *D. Verrilli* Dall, 1900.

Genus UNGULINA Daudin.

This is *Ungulina* Daudin,[1] sole example *U. rubra* Roissy[2] and *Clotho* Basterot, 1825, not Faujas St. Fond, 1808.

The type is *Tellina cuneata* Spengler,[3] but not of d'Orbigny, 1845. This specific name must be adopted in place of the more familiar *rubra* of Roissy. The *Ungulina transversa* of Lamarck,[4] is united by Deshayes with Lamarck's *U. oblonga*, and both are identical with

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[1] Bosc, Hist. Nat, Coq., III, 1802, p. 86.

[2] Idem, pl. xx, figs. 1, 2.

[3] Chemnitz, Conch. Cab. VI, 1782, p. 135, pl. XIII, fig. 131.

[4] Animaux sans Vertébres, V, 1818, p. 487.

U. rubra Roissy[1] and the earlier *cuneata* of Spengler. Conrad[2] reported the presence of this species in a mass of coral rock containing many West Indian boring mollusks, but this discovery has not been confirmed by any subsequent collector or explorer, though in itself not inherently improbable. In the absence of confirmatory evidence we can not regard the presence of *Ungulina cuneata* in the American or West Indian fauna as sufficiently established.

No species of *Felania* in the correct sense, or of *Joannisiella*, are known from the Western Hemisphere.

LIST OF EAST AMERICAN SPECIES.

DIPLODONTA TORELLI Jeffreys, 1876.

North Atlantic, southeast of Greenland, in 1,450 fathoms. Spitsbergen, in moderate depths of water. Also Aleutian Islands.

A rude, chalky species of large size, which may perhaps be found later on the Labrador coast. The figure of *Lucina leucophæata* Reeve, 1850, somewhat resembles this species.

DIPLODONTA PUNCTATA Say, 1822.

Cape Hatteras, North Carolina, to Rio de Janeiro, Brazil, in 14 to 124 fathoms, southward to the Straits of Magellan, and thence north to Chiloe Island.

This is *Amphidesma punctata* Say, 1822; *Lucina guaraniana* d'Orbigny, 1846; *Lucina venezuelensis* Dunker, 1848; *L. janeirensis* Reeve, 1850; *L. subglobosa* C. B. Adams (1847), 1852; *L. brasiliensis* Mittré, 1850 (but not *L. brasiliana* d'Orbigny, 1846, or *brasiliensis* Philippi, 1850); *Diplodonta Phillippii* Huppé, 1854, and *Mysia pellucida* Heilprin, 1889.

This is a plain, globose shell, with feeble incremental sculpture and microscopic radial striæ. The anterior end is somewhat attenuated and the posterior expanded. The young are often nearly orbicular. The specific name is derived from the punctation visible on the disk, internally in many specimens. It appears to pass through Magellan Strait and reach as far north as the island of Chiloe, on the Pacific side of South America.

DIPLODONTA NUCLEIFORMIS Wagner, 1838.

Cape Hatteras, North Carolina, to Porto Rico and St. Thomas, West Indies, in 15 to 52 fathoms.

This is *Mysia nucleiformis* of Wagner; *Loripes elevata* Conrad, 1845; *Cytherea sphærica* H. C. Lea, 1845; *Diplodonta elevata* Conrad, 1858, and *Mysia carolinensis* Conrad, 1875.

It is a small, suborbicular, globose species, which goes back to the Oligocene in time.

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[1] Sonnini's Buffon, Moll. VI, 1805, p. 575, pl. LXVI, fig. 4.

[2] Amer. Jour. Sci. XXIII, no. 2, 1833, p. 345.

DIPLODONTA PORTEZIANA d'Orbigny, 1846.

Rio de Janeiro, Brazil, and adjacent region. This is probably the same as *Lucina leucophæata* Reeve, 1850.

DIPLODONTA PATAGONICA d'Orbigny, 1842.

Near Rio de Janeiro, Brazil, in 59 fathoms, south to San Blas Bay.

DIPLODONTA (FELANIELLA) CANDEANA d'Orbigny, 1846.

Belize to Brazil, in 2 to 25 fathoms.

DIPLODONTA (FELANIELLA) VILARDIBOANA d'Orbigny, 1846.

Coast of Argentina, in 11 fathoms.

DIPLODONTA (PHLYCTIDERMA) SOROR C. B. Adams, 1852.

Texas coast to Jamaica. Pleistocene in South Carolina.

D. kiawahensis Holmes, 1858, is synonymous.

DIPLODONTA (PHLYCTIDERMA) NOTATA Dall and Simpson, 1901.

Marco, Florida, to Porto Rico.

Like *D. candeana*, but profusely punctate.

DIPLODONTA (PHLYCTIDERMA) SEMIASPERA Philippi, 1836.

Cape Hatteras, North Carolina, to Cape San Roque, Brazil, in 14 to 20 fathoms.

Lucina granulosa C. B. Adams, 1845, and Dunker, 1853; *L. semireticulata* (part) d'Orbigny, 1846, are synonymous.

DIPLODONTA (PHLYCTIDERMA) SEMIRETICULATA d'Orbigny, 1846.

San Sebastian, Brazil, and southward to the coast of Uruguay and Argentina in 11 fathoms.

D. semireflecta Krebs, 1864 (*lapsus*) and *D. platensis* Dall, 1899, are synonymous. D'Orbigny confused this and the last species under one name, though noting the differences (in 1853) between the Argentine and Antillean forms; but the figure given in the original publication is of the Argentine type, and I have therefore restored his name. The Antillean shell is more globular, smaller, and usually with the sculpture in separate granules or pustules, while that of the Argentine form is more like the reticulations of a stretched net.

DIPLODONTA (PHLYCTIDERMA) PUNCTURELLA Dall, 1899.

Jamaica, Porto Rico, St. Thomas, and receding to the Oligocene.

DIPLODONTA (SPHÆRELLA) VERRILLI Dall, 1899.

From Marthas Vineyard, Massachusetts, to North Carolina, in 15 to 69 fathoms.

This is *Diplodonta turgida* Verrill and Smith, 1881, not of Conrad, 1848.

LIST OF WEST AMERICAN SPECIES.

DIPLODONTA (TORELLI Jeffreys var.?) ALEUTICA Dall, 1901.

Southern part of Bering Sea, from the Pribilof Islands to the Aleutians, and eastward to the Shumagin Islands, in 3 to 13 fathoms.

A chalky, subrectangular species, with coarse epidermis. The young have a smooth surface and dark gray periostracum. The young of *Torelli* have a yellow periostracum, profusely wrinkled. The adults appear almost identical, though the regions occupied are on opposite sides of the world.

DIPLODONTA ORBELLA Gould, 1852.

Kadiak Island, Alaska, to the Gulf of California, in 5 to 30 fathoms.

Sphærella tumida (Conrad, Manuscript) Carpenter, 1863,[1] is synonymous. *D. subrugosa* Philippi[2] should be compared with it.

The gills in this species[3] are all developed, the foot with a short, stout stem, and distally subspherically bulbous; there are two entire siphonal orifices, without siphons, the anal exhibiting a short valve. It is the habit of the animal to form a sort of nest of sand and adventitious matter, cemented by mucus, with long tubular openings, the whole of irregular form, but completely concealing the inmate.

DIPLODONTA SUBQUADRATA Carpenter, 1855.

Catalina Island, California, south to Panama, in 16 to 36 fathoms.

More compressed and thinner than *D. orbella*, and of a different outline. In the description the edge of the excavated hinge plate has been mistaken for a lateral tooth. It is not *D. subquadrata* Gabb (=*D. gabbi* Dall), 1873, from the Tertiary of Santo Domingo, West Indies, but is probably referred to[4] by the name *D. undata* by Carpenter, 1857.

DIPLODONTA PUNCTATA Say, 1822.

From Magellan Straits northward to the island of Chiloë. See Atlantic list.

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[1] Not of Proc. Zool. Soc. London, 1856, p. 215.

[2] Zeitsch. Mal., 1848, p. 183.

[3] External and internal laminæ, direct and reflected, with an appendix.

[4] Mazatlan Catalogue, p. 103.

DIPLODONTA (FELANIELLA) OBLIQUA Philippi, 1846.

Cape St. Lucas to Guayaquil.

This is *Diplodonta obliqua* Philippi, 1846, but not *Lucina obliqua* Philippi, 1850 (April), nor of Reeve (June), 1850, Defrance, 1823, nor Goldfuss, 1841. *Lucina calculus* Reeve, 1850, is synonymous.

DIPLODONTA INCONSPICUA Philippi, 1842.

Island of Chiloe, on the southern coast of Chile.

This is *D. inconspicua* Philippi[1] and Huppé.[2] It is a rude species, with a coarse periostracum, the analogue in the Southern Hemisphere of *D. torelli* var. *aleutica* Dall in the northern Pacific.

DIPLODONTA (FELANIELLA) SERICATA Reeve, 1850

Lower California to Panama.

This species varies slightly in outline and convexity, according to its state of growth, and has been described in the Iconica under the names of *Lucina cornea, L. nitens*, and *L. sericata* Reeve. Carpenter called it *Felania serricata* (*sic*), by which name it is best known. He labeled some rather convex specimens in the U. S. National Museum *L. tellinoides* Reeve, but from the best information I can obtain the true *L. tellinoides* is a *Pseudomiltha*, as elsewhere indicated.

DIPLODONTA (PHLYCTIDERMA) CÆLATA Reeve, 1850.

Bay of Guayaquil, Cuming.

This species belongs to the same group as *D. semirugosa* Dall, but differs by its almost internal ligament, larger size, and coarser sculpture.

DIPLODONTA (PHLYCTIDERMA) SEMIRUGOSA Dall, 1899.

Gulf of California to Panama.

This is *Diplodonta semiaspera* of Carpenter, 1857, but not of Philippi, 1836, which is the West Indian form. The Japanese species which has been called by the same name is now known as *D. japonica* Pilsbry.

NOTES.

Lucina (*Diplodonta?*) *capax* Carpenter, 1863, page 69, from Panama, appears to be a *nomen nudum*. *Lucina obliqua* Philippi, 1850, is an uncertain species, both as to habitat and characters. It is not the *Diplodonta obliqua* Philippi, 1846. The *Lucina punctata* mentioned by Carpenter and others as inhabiting Panama is not the *Diplodonta punctata* Say or the *Codakia punctata* Linnæus. It was probably intended for the latter, which is not found on the west American coast, but is Polynesian. The references to west-coast localities are probably based on *Codakia colpoica* Dall. *L. punctata* of Poulsen's catalogue is probably *L. orbicularis* Linnæus. The *Diplodonta semiaspera* of Carpenter in the Mazatlan catalogue was a compound of several species. His variety *discrepans* is indeterminable. A pencil sketch of it in my possession, made by Carpenter, looks not unlike the young of *Diplodonta orbella* Gould.

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[1] Wiegmann's Archiv., 1842, p. 74.

[2] Gay's Chile, VIII, 1854, p. 357, atlas, pl. VIII, fig. 4.

Family LUCINIDÆ.

This family differs from the *Diplodontidæ* by its less perfectly developed gills; from the *Thyasiridæ* by the inclusion within the general mass of the body of the hepatic and sexual glands, and also by the gills being less developed; from the *Corbidæ* by the general shell characters and the loriform anterior adductor scars prolonged into the area of the disk. The branchial orifice is usually incomplete, and the anal is supplemented by a greatly developed introvertible tube, corresponding to the "valve" of an ordinary Teleodont siphon, and usually supposed to be, but actually not, homologous with a true siphon. If, as seems possible, the Silurian *Prolucina* is a true Lucinoid, this is one of the few families of Teleodonta which are represented in the Silurian, but the characteristics of *Prolucina* are not yet fully elucidated. Excluding pre-Tertiary groups, the family contains the following genera:

CODAKIA Scopoli, 1777.

LUCINA Lamarck, 1799.

LORIPES Cuvier, 1817.

MYRTÆA Turton, 1822.

PHACOIDES Blainville, 1825.

DIVARICELLA von Martens, 1880.

These groups and their subdivisions will be taken up serially.

Genus CODAKIA Scopoli.

This is *Codakia* Scopoli, 1777; *Orbiculus* (sp.) Megerle, 1811 (not *Orbicula* Lamarck, 1799); *Lentillaria* Schumacher, 1817; *Lenticularia* Gray, 1847; *Ctena* Mörch, 1860 (not *Ctenia* Lepel. et Serv., 1825, *Lepidoptera*); *Jagonia* Recluz, 1869; *Antilla* de Gregorio, 1885 (not *Antillia* Duncan, 1864, *Corallia*); *Codakia* Fischer, 1887, and *Lintellaria*, Bucquoy, Dollfus, and Dautzenberg, 1898 (*err. typ. pro Lentillaria*).

This is a well-marked genus which may be divided as follows:

Codakia s. s. Shell large and heavy with more or less distinctly reticulate sculpture, valves white externally, if colored the color is internal and chiefly marginal; with small beaks and lunule, not inflated, the ligament and resilium large, deeply inset, the former with an external calcareous coating; margins entire; foot moderately elongated but not loriform.

Dental formula: $\frac{\text{L lol. 1010. lol}}{\text{R olo. 0101. olo}}$. Type, *Chama codok* Adanson.

The posterior lateral teeth are obscured by the growth of the ligament in the adult, but traces of them can almost always be noted. The cardinals are not bifid and the anterior right cardinal is often obscured by the excavation of the lunule in front of it in the adult.

Jagonia Recluz. Shell smaller, lighter, frequently tumid and very inequilateral; beaks more prominent and the lunule, relatively, often larger; ligament and resilium external, on a narrow nymph, not coated with shelly matter; posterior laterals distinct; margins usually crenulate; foot differing little from the ordinary Pelecypod type. Type, *Le jagon* Adanson, = *Venus orbiculata* Montagu + *Lucina pecten* Lamarck.

In these forms the radial part of the sculpture is relatively more pronounced than in *Codakia.* The name *Ctena* of Mörch would have precedence over *Jagonia* if not regarded as preoccupied by the prior use of *Ctenia* in entomology.

In the typical division of the genus *C. punctata* and *C. tigerina* Linnæus (as *Venus*, 1758) are East Indian and Indo-Pacific, *C. orbicularis* Linnæus is Antillean, and a distinct species, here described, is found on the Pacific coast. These have been lumped together by most writers hitherto to the great confusion of the nomenclature; though, as Hanley pointed out half a century ago, Linnæus himself originally discriminated the three first mentioned and assigned the true localities to them; though he afterwards confounded the second and third. A similar confusion has, with more excuse, attended the names of the more common species of *Jagonia.*[1]

It is possible that when we know more about them some of the small species, here referred to, *Jagonia* may require a separate section for their reception, but for the present this seems unjustified. The East American species are as follows:

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[1] The Mediterranean species, long confounded with the *Lucina pecten* of Lamarck, is the *Tellina reticulata* of Poli, 1798, not of Linnæus, 1766; the *Lucina reticulata* of Payraudeau, 1826, not of Lamarck, 1818 (=*Semele* sp.); the *Lucina squamosa* and *pecten* of authors, but not of Lamarck; the *Lucina decussata* of Costa, 1830; and, according to Dautzenberg (Moll. de Roussillon) the *Lucina carnaria* and *mirabilis* of Locard, 1892. The latter is not the *L. mirabilis* of Dunker, 1865, which is *Miltha Voorhœvei* Deshayes, 1857, from Mozambique. The Mediterranean shell must then take the name of *Codakia* (*Jagonia*) *decussata* (Costa).

The common Indo-Pacific species has almost as complex synonymy, having been first described from specimens probably collected at the Sandwich Islands by Nuttall, but erroneously referred (like some other species of Nuttall) to San Diego, California, where no *Jagonia* exists. It is the *Lucina bella* Conrad, 1837, not of Carpenter, 1857; *L. fibula* (part) Reeve, 1850; *L. ramulosa* Gould, 1850; *L. divergens* of Philippi, 1850; and has been referred to *L. squamosa* and *L. pecten* of Lamarck by many authors. The name *Codakia* (*Jagonia*) *bella* (Conrad) must be retained for it.

CODAKIA ORBICULARIS Linnæus, 1758.

From St. Augustine, Florida, southward to the Keys; at Bermuda; also on the west coast of Florida north to Little Sarasota Bay; Texas; East Mexico; throughout the West Indies as far as Maceio, Brazil; (Senegal?). In 1 foot water, among algæ, Krebs.

This is the *Venus orbicularis* of Linnæus, 1758; *V. tigerina* (*part*), Linnæus, 1766; *Cytherea tigerina* Lamarck, *ex parte*, 1818, but not *C. tigrina* Lamarck, 1818; *Lucina tigerina* Reeve, 1850, not of Linnæus, 1758; *Lucina pusilla* Gould (nepionic shell), 1862; but not *Lucina orbicularis* Sowerby, 1837, nor Deshayes (Morea) 1836. *Venus incrustata* Linnæus, 1758, is supposed by Dillwyn to be based on an artificially polished specimen of this group.

CODAKIA CUBANA Dall, 1901.

Gulf of Mexico, at station 36, in 84 fathoms, U. S. Coast Survey steamer *Blake*.

A small, thin, and delicate species, with obsolete sculpture, as becomes its rather deep-water habitat. It was erroneously identified with *Lucina lenticula* Reeve, in the Blake Report of 1886.

CODAKIA (JAGONIA) ORBICULATA Montagu, 1808.

This species was first described by Montagu from an adventitious specimen supposed to be British. It is the *Venus orbiculata* Montagu, 1808, and Dillwyn, 1817; *Lucina squamosa* Lamarck, 1818, not of Lamarck, 1806; *Lucina pecten* Lamarck, 1818 (not of many authors); *Lucina imbricatula* C. B. Adams, 1845; *Lucina occidentalis* Reeve, 1850; *Lucina obliqua* Reeve, 1850 (according to E. A. Smith), but not of Defrance, 1823, or Philippi, 1850; *Lucina pectinata* C. B. Adams, 1852, not of Gmelin, 1792, or Carpenter, 1857; *L. nasuta* Guppy (erroneously as of Conrad), 1887; but not *Lucina orbiculata* Nyst, of the Belgian Tertiaries. Guppy's name is probably an error for *L. nassula* Conrad, which belongs in a totally distinct group.

This type appears to be very variable and to extend its range from Senegal and the Azores to the east coast of America and the Antilles. The following forms may be discriminated:

JAGONIA ORBICULATA var. ORBICULATA Montagu.

Cape Lookout, North Carolina, and Bermuda, south to the West Indies, the Abrolhos Islands and San Sebastian, Brazil; from low water to 52 fathoms: Senegal, Azores.

This is the common form in which the sculpture is of rather strong ribs radiating from the umbones and more or less divaricate toward the ventral margin, but not spinose or imbricate. It is *L. occidentalis* Reeve and *L. pectinata* C. B. Adams.

JAGONIA ORBICULATA var. FILIATA Dall, 1901.

Florida Keys, Bermuda, and southward to Cuba and Yucatan, in 85 to 300 fathoms.

This is the deep-water type with obsolete sculpture and entire, not divaricating, riblets radiating directly to the margin. Reeve's figure of *obliqua* fairly represents this form.

JAGONIA ORBICULATA var. IMBRICATULA C. B. Adams.

Jamaica, Santo Domingo, Santa Lucia, Curaçao.

This form has straight, strong ribs, not divaricating, and concentrically, evenly subimbricate.

JAGONIA ORBICULATA var. RECURVATA Dall, 1901.

Florida Keys to Cape San Antonio, in 8 to 300 fathoms.

This form is more plump and the dorsal radials are distally arcuately recurved, meeting the shell margin at right angles.

CODAKIA (JAGONIA) COSTATA d'Orbigny, 1846.

Cape Lookout, North Carolina, southward to Rio de Janeiro, and San Sebastian, Brazil, in 13 to 85 fathoms.

This is *Lucina costata* d'Orbigny, 1846, but not of Tuomey and Holmes, 1856; *L. textilis* Philippi, April, 1850, but not of Guppy, 1896; *Lucina antillarum* Reeve, August, 1850; *Lucina ornata* C. B. Adams (Manuscript 1847), 1852, but not of Reeve, 1850, nor of Agassiz, 1845.

This species varies from suborbicular to very inequilateral, but is easily recognizable by its fasciculated riblets and wedge-like shape.

CODAKIA (JAGONIA) PORTORICANA Dall, 1901.

Mayaguez Harbor and San Juan de Porto Rico, in 20 to 30 fathoms.

A small and inconspicuous species, which is provisionally located in this group.

CODAKIA (JAGONIA?) PECTINELLA C. B. Adams, 1852.

Jamaica and southward to Point Malaspina, on the Argentine coast, where it was dredged in 51 fathoms.

This little species is quite distinct from any of the others and wants the right anterior cardinal tooth. The radial ribs are strong and crossed by slender, sparse threads, which become lamellose on either side of the beaks. It may eventually be shown to be better placed in one of the groups included in *Phacoides*.[1]

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[1] It is figured in the Porto Rico Report, pl. VI, fig. 9.

The West American species are as follows:

CODAKIA COLPOICA Dall, 1901.

Gulf of California.

This is *Lucina tigerina* Carpenter, but not of Linnæus; *L. punctata* of various authors, but not of Linnæus. The true *tigerina* Linnæus (*L. exasperata* Reeve) is Indo-Pacific, and so is *L. punctata*. Both of them have a sculpture very distinct from that of the Gulf species, and both have erroneously been reported from Panama, and the latter from the Galapagos by Wimmer.

CODAKIA (JAGONIA) MEXICANA Dall, 1901.

Gulf of California to Panama and Guacomayo.

This species is much like *C. orbiculata* Montagu, but has a quite different lunule. It is the *Lucina pectinata* Carpenter, 1857, but not of Gmelin, 1792, or C. B. Adams, 1847; *L. fibula* Reeve, *ex parte* (fig. 33 only), 1850; *L. bella* Carpenter, 1864, not of Conrad, 1837.

CODAKIA (JAGONIA) GALAPAGANA Dall, 1901.

Galapagos Islands, Chatham, Hood, and Indefatigable.

This form is easily distinguished from *C. mexicana*, which has entire ribs, by its coarser, somewhat annulated, and distally fasciculated radial ribs. It does not appear to pass south of the Galapagos Islands.

CODAKIA (JAGONIA) CHIQUITA Dall, 1901.

Off Lower California at station 2830, dredged by the U. S. Fish Commission in 66 fathoms, sand.

This is perhaps the smallest species of *Jagonia* in west American waters; with fine concentric and sparse obscure radial sculpture, and suborbicular outline.

NOTE.—A *Lucina distinguenda* is enumerated by Fischer from Panama,[1] but without any author's name, and I am unable to discover any description or other reference to it in the literature which would enable me to determine what shell was intended. It is true, Fischer refers to it as the Pacific analogue of *L. tigerina* Linnæus, but as both *tigerina* and *punctata* have been reported from Panama, it is possible that there are more than one species of large *Codakia* native to that locality; and the one referred to by Fischer may prove, if identified, distinct from the Gulf species which I have named *C. colpoica*.

Genus LUCINA (Bruguière) Lamarck.

This is *Lucina* Bruguière, 1797 (not 1792, as often stated), in part; *Lucina* Lamarck, 1799; *Anodontia* Link, 1807; and *Loripes* of many authors, but not of Cuvier, 1817, after Poli, 1791. Type, *Lucina edentula* Linnæus.

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[1] Manuel, p. 160, 1881.

Shell inflated, thin, concentrically striated, anterior and posterior dorsal areas obsolete; lunule deep and narrow, no visible escutcheon; ligament and resilium deeply inset but not occluded; margins entire, anterior adductor scar long, hinge wholly edentulous, shell usually large.

The following subgenus may be admitted:

Loripinus Monterosato, 1883. Type, *Lucina fragilis* Philippi (=*L. edentula* Brocchi, not Linnæus), Mediterranean.

Shell small, with the ligament obsolete and the resilium wholly internal; the anterior adductor scar short and wide, otherwise like *Lucina*.

The following are the American species:

LUCINA CHRYSOSTOMA (Meuschen) Philippi, 1847.

Bermuda, South Florida, the West Indies, and northern coast of South America, in moderate depths of water.

This is *Tellina crysostoma* Meuschen, 1787, and *Venus edentula* Chemnitz, 1784; *Anodontia alba* Link, 1807; *Lucina chrysostoma* of Philippi, 1847, and Mörch, 1853.

It is the *Lucina edentula* of Reeve, 1850, and many other writers, but Hanley has shown that the Linnæan *edentula* (1758) was probably that named by Reeve *L. ovum*, an oriental form described by Forskal under the specific name of *globosa* (1776), and with which, according to von Martens (1880), *L. pila* Reeve is synonymous.

LUCINA PHILIPPIANA Reeve, 1850.

Cape Hatteras, North Carolina; Bermuda, and southward through the West Indies; Japan?.

This is the *L. edentula* Philippi, 1847, not Linnæus, 1758, and the *L. schrammi* Crosse, 1876. It varies sufficiently in its outline and convexity to suggest, in the absence of a series, that the student is dealing with more than one species.

A young valve of this species in defective condition may be the shell identified by Smith in the Challenger bivalves from near Bermuda as *Lucina barbata* of Reeve, an identification Mr. Smith regards as doubtful.

LUCINA EDENTULOIDES Verrill, 1870.

Magdalena Bay, Lower California, and in the Gulf of California.

It is *Loripes edentuloides* Verrill, 1870, and possibly was the shell intended by Carpenter when he cited a *Lucina capax* from Panama, to which I have not been able to find any other reference in the literature. This species is very similar to the West Indian form, but differs by its more central umbones, while the very similar *Lucina bialata* Pilsbry, of Japan, carries the process of centralizing the beaks almost to completion.

LUCINA PHENAX Dall and Simpson, 1901.

Mayaguez and San Juan harbors, Porto Rico, in 5 to 30 fathoms.

Small, delicate, sparsely concentrically threaded, with grayish periostracum, translucent white shell, the aspect of *Loripinus*, but the external ligament of *Lucina*. This species is described in the report on Porto Rico mollusks, prepared for the U. S. Fish Commission.

Genus LORIPES Cuvier.

Shell suborbicular with feeble sculpture, a narrow elongate lunule, posterior dorsal area obscure or absent; ligament obsolete, resilium separated from it, deeply immersed, wholly internal; hinge with the posterior laterals and right anterior cardinal absent, the anterior laterals often obsolete; margins entire, anterior adductor scar long and narrow.

Type, *Amphidesma lucinalis* Lamarck = *Tellina lactea* of Poli and others, but not of Linnæus, *Lucina leucoma* Turton, *L. amphidesmoides* and *lacteoides* Deshayes, and *L. elata* Locard. Habitat, Mediterranean.

The genus is *Loripes* Cuvier, 1817, not Schweigger, 1820; *Thyatira* Gray, 1847, not of Hübner, 1816; *Ligula* Menke, 1830, not of Montagu, 1803; *Lucinida* d'Orbigny, 1846, and *Lucinidea* Barrois (in Zittel), 1887.

The American species are:

? LORIPES CLAUSUS Philippi, 1848.

Belize, British Honduras, Rev. W. A. Stanton.

This species is solid, compressed, sharply concentrically, and minutely radially, striated; with a small but very distinct anterior dorsal area, deep short lunule, and well-developed anterior lateral tooth.

Lucina sulcata Reeve, May, 1850, is externally very similar, from the figure, but Reeve gives no data as to the hinge characters. *L. clausus* is figured by Philippi, 1850. Only one dead valve was received from the collector.

LORIPES CRYPTELLUS d'Orbigny, 1846.

Pernambuco, Brazil.

This species has a large dorsal anterior area, the hinge has the laterals obsolete as in *L. lucinalis* Lamarck, and the surface concentrically striate. As figured by d'Orbigny, the valves are markedly unequal, but this may have been an individual abnormality. It is much more inflated than *L. clausus*.

This species is called *Lucina* and *Lucinida cryptella* by d'Orbigny in his text, but on the Plate LXXXIV of the atlas, where it is figured, the name is *Lucina brasiliana* d'Orbigny. It is not the *Lucina brasiliensis* of Philippi, 1848.

The name *Loripes* has been very generally applied to the large, globose edentulous shells which are properly known as typical *Lucina*, but these have not an internal resilium. *Loripes lens* of Verrill and Smith, 1880, and *L. compressa* Dall, 1881, should be placed in the genus *Myrtæa*, as they also are destitute of the internal resilium which is the chief characteristic of the genus *Loripes*.

Genus MYRTÆA Turton, 1822.

This is *Cyrachœa* Leach, 1852, and *Ortygia* (sp.) Brown, 1827. Type, *Venus spinifera* Montagu, 1803. Northern Europe.

Shell ovate or subrectangular, not inflated, the dorsal areas obsolete, sculpture chiefly concentric; lunule and escutcheon long and narrow; ligament and resilium deep-seated, but not internal, anterior adductor scar rather short; hinge with the right anterior cardinal normally absent and the left laterals frequently obsolete.

Two sections are discriminable:

Myrtæa s. s. Shell of moderate size, with purely concentric sculpture.

Eulopia Dall, 1901. Shell small, with radial vermicular sculpture between stronger concentric lamellæ. Type, *Lucina sagrinata* Dall, 1886.

This group appears in the Oligocene of Bowden, Jamaica.

The American species are as follows:

MYRTÆA LENS Verrill and Smith, 1880.

From Cape Cod, Massachusetts, south to the Antilles and Rio de Janeiro, Brazil, in 50 to 464 fathoms, bottom temperatures ranging from 41.5° to 46.5° F.

This is *Loripes lens* of Verrill and Smith, 1880, but not *Lucina lens* of Roemer (Nordd. Kreidegeb.), 1841, nor *Lucina lens* of H. C. Lea (Virginia miocene) 1845.

MYRTÆA COMPRESSA Dall, 1881.

Cuba and Sombrero, West Indies, in 72 to 424 fathoms.

This is *Loripes compressa* Dall, 1881, and may prove to be an extremely transverse and compressed variety of *M. lens* Verrill and Smith.

MYRTÆA PRISTIPHORA Dall and Simpson, 1901.

Porto Rico, Santa Lucia, Barbados, and Grenada, in 30 to 300 fathoms.

Described and figured in the Porto Rico report of the U. S. Fish Commission.

MYRTÆA (EULOPIA) SAGRINATA Dall, 1886.

Florida Keys and westward to Yucatan Strait, in 85 to 300 fathoms.

A peculiar small shell with which *Lucina fabula* Reeve is naturally associated. It was described as *Lucina sagrinata.*[1]

NOTE.—The type of this genus is the *Venus spinifera* Montagu, 1803; + *Myrtæa spinifera* Turton, 1822; *Lucina hiatelloides* (Basterot) Philippi, 1836; and *Lucina spinosa* Philippi, 1844.

No species of this genus are yet reported from the Pacific coast.

Genus PHACOIDES Blainville.

This is *Phacoides* Blainville, 1825; *Lucina* Lamarck, 1801 (but not Lamarck, 1799); *Triodonta* (sp.) Gray, 1851 (not of Schumacher, 1817); *Here* Gabb, 1866; *Linga* de Gregorio, 1885; *Cavilucina* and *Dentilucina* Fischer, 1887.

This comprises most of the species included by many authors in *Lucina*, in a broad sense, but not the original *Lucina* of Lamarck, which has very generally been called *Loripes* erroneously.

Owing to the very numerous modifications of characters shown in this group, it becomes necessary, for clearness, to divide it into a rather large number of subdivisions, both subgenera and sections.

Subgenus **Phacoides** Blainville, s. s. Type *Tellina pectinata* Gmelin (+ *Lucina jamaicensis* Lamarck).

Shell lentiform, with strong dorsal areas and chiefly concentric sculpture, the cardinal teeth obsolete in the adult, but the laterals well developed.

This is *Dentilucina* Fischer.

Subgenus **Here** Gabb. Type, *Lucina richthofeni* Gabb.

Shell solid, globose, with developed dorsal areas and conspicuous concentric sculpture, the lunule often deeply impressed and the right anterior cardinal effaced, the other teeth well developed.

This is *Lucina* Schumacher, 1817, not Lamarck, 1799, + *Linga* de Gregorio, 1885. It may be divided into sections, the typical group, as above, and:

Section *Pleurolucina* Dall, 1901. Type, *Lucina leucocyma* Dall, 1886.

Shell with a small number of large radial ribs in addition to the concentric sculpture.

Section *Cavilucina* Fischer, 1887. Type, *Lucina sulcata* Lamarck.

Shell small, compressed, concentrically striate, the areas and teeth often obsolete, the lunule small and often deep.

Subgenus **Lucinisca** Dall, 1901. Type, *Lucina nassula* Conrad.

Shell lentiform, white, with well-marked dorsal areas, the sculpture reticulate and muricate, the right anterior cardinal obsolete.

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[1] It is figured in the Proc. U. S. Nat. Mus., XII, 1889, p. 263, pl. XIV, fig. 11.

This is a well-marked group, belonging in the warmer seas and having a very elegant type of sculpture.

Subgenus **Miltha** H. and A. Adams. This is *Miltha* H. and A. Adams, 1857, and *Milthea* Meek, 1876. The type is *Lucina childreni* Gray, 1825, as *Tellina.*

This group is solid, compressed, concentrically striate, with a conspicuous periostracum, narrow impressed lunule, inconspicuous dorsal areas, deeply inset but not internal ligament and resilium and entire margins. It is divisible into two sections:

Miltha s. s. Hinge with two clean-cut cardinal teeth in each valve, the inner pair bifid, the laterals absent or obsolete.

Pseudomiltha Fischer, 1885. Type, *L. gigantea* Deshayes, Eocene of Paris.

Shell much like *Miltha*, but with the hinge teeth wholly obsolete.

This type goes back to the beginnings of the Tertiary and includes some of the largest lucinoid forms known; one, the *Lucina megameris* Dall, of the Jamaican Oligocene, reaches a length of some 10 inches.

Subgenus **Lucinoma** Dall, 1901. Type, *Lucina filosa* Stimpson.

Shell usually large, lentiform, white, with a conspicuous periostracum, concentrically lamellose or striated; the cardinal teeth developed, the inner pair usually bifid; the laterals obsolete or absent, the inner margins entire.

This is a well-marked group with extensive geographical and geological distribution, inhabiting preferably cold waters and frequently abyssal depths.

Subgenus **Callucina** Dall, 1901. Type, *Lucina radians* Conrad.

Shell Dosinoid, concentrically filose, sometimes with feeble radial sculpture; the dorsal areas obsolete; the lunule small, comprised chiefly in one valve and fitting into a recess in the opposite valve; hinge with one cardinal in each valve, the other teeth feeble or absent; inner margins crenulate.

The *L. concentrica* Reeve is also a member of this group, which comprises the typical section, as above; and

Section *Epilucina* Dall, 1901. Type, *Lucina Californica* Conrad.

Shell veneriform, convex, all the hinge teeth developed, inner margins entire; otherwise like *Callucina.*

Subgenus **Parvilucina** Dall, 1901.

Shell small, plump, often inequilateral; sculpture more or less reticulate but not muricate, teeth small, but all usually present.

Section *Parvilucina* s. s. Type, *Lucina tenuisculpta* Carpenter.

Dorsal areas obscure or obsolete, sculpture feeble.

Section *Bellucina* Dall, 1901. Type, *Parvilucina eucosmia* Dall, 1901 (=*Lucina pisum* Reeve, 1850, not Sowerby, 1837, nor d'Orbigny, 1841, nor Philippi, 1850).

Dorsal areas and sculpture strong.

? Subgenus **Prolucina** Dall, 1896. Type, *Lucina prisca*[1] Hisinger, Silurian.

Shell compressed, arcuate, almost rostrate, the anterior portion larger, the anterior adductor scars high, large, Lucinoid; the posterior narrow, elongate. Teeth unknown.

This group appears to be genuinely Lucinoid, though *Paracyclas* Hall, generally referred to the Lucinacea, should probably be excluded from it, having no really Lucinoid features.

EAST AMERICAN SPECIES.

PHACOIDES PECTINATUS Gmelin, 1792.

St. Augustine, Florida, to the West Indies and southward to Montevideo, Uruguay, in shallow water.

This is *Tellina pectinata* Gmelin, 1792, and Wood, 1815; *Tellina jamaicensis* Spengler, 1798; *Tellina scabra* (Chemnitz) Wood, 1815; *Lucina jamaicensis* Lamarck, 1818; *Lucina scabra* Gray, 1825; *Lucina* (*Phacoides*) *jamaicensis* Blainville, 1825; *Lucina funiculata* Reeve, 1850, but not *Lucina pectinata* C. B. Adams, 1852, nor Carpenter, 1857.

PHACOIDES (HERE) PENSYLVANICUS Linnæus, 1758.

Cape Hatteras, North Carolina, south to and throughout the West Indies and the continental shores adjacent, in shallow water, one-fourth to 6 fathoms.

This is *Venus pensylvanica* Linnæus, 1758; *Lucina pennsylvanica* Reeve, 1850; *Lucina grandinata* Reeve, 1850, and *Lucina speciosa* Reeve, 1850, but not *L. speciosa* Rogers, 1836.

This well-known species is a very beautiful object when its periostracum is perfect, but the differences in the latter upon which Reeve founded one of his species are not constant in individuals from the same locality. The oriental *Lucina virgo* Reeve, which Tryon unites with this species, appears to me to be distinct, but I have some suspicion that the *L. obliqua* Philippi, 1850 (April, not of Reeve, June, 1850), may have been founded on a young shell of this species.

PHACOIDES (HERE) ADANSONII d'Orbigny, 1839.

Senegal, Canaries; St. Thomas, and other localities in the Windward Islands of the West Indies.

This is the *Lucina columbella* of authors, but not of Lamarck, whose type is a fossil of the French Miocene. It seems rare in the West Indies. It is not the *Lucina adansonii* Reeve (1850) = *senegalensis* Reeve, in errata.

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[1] See Zittel, Textb. Pal. I, 1896, p. 408.

PHACOIDES (HERE) AURANTIUS Deshayes, 1830.

St. Thomas, Santa Cruz, Guadeloupe, the Virgin Islands, and other localities in the Lesser Antilles, in one-fourth to 1 fathom water, sandy bottom.

This species is distinguishable from *P. adansonii* by other characters than its salmon-colored margins. It is the *Lucina aurantia* of Deshayes and has also been reported from the Azores.

PHACOIDES (HERE) SOMBRERENSIS Dall, 1886.

Northern part of the Gulf of Mexico south to Sombrero Island, West Indies, in 60 to 84 fathoms.

This resembles *P. adansonii* in miniature.[1]

PHACOIDES (PLEUROLUCINA) LEUCOCYMA Dall, 1886.

Cape Hatteras, North Carolina, and south to Cuba, in 49 to 683 fathoms.

This is immediately recognizable by its few broad ribs and small white shell, which is figured with the preceding.[2]

PHACOIDES (CAVILUCINA) TRISULCATUS Conrad, 1841.

Cape Hatteras, North Carolina, south to Cabo San Roque, Brazil, in 10 to 20 fathoms.

Notable for its obliquity and its two or three strongly marked resting stages, from which the name is derived. The original *Lucina trisulcata* Conrad, is a miocene fossil. The recent shell usually called by this name is often very similar to the fossil, but there is a larger, flatter, less coarsely sculptured form in the West Indies which has much less emphatic resting stages, and, if not distinct, is at least a recognizable variety, which may be called *blandus*.[3] It is intermediate between the typical *P. trisulcatus* and the Pacific coast *P. lamprus*. It varies from white, through yellow, to orange color.

PHACOIDES (LUCINISCA) NASSULA Conrad, 1846.

Cape Hatteras, North Carolina, south to Cuba and west to Mobile Bay, in 7 to 200 fathoms.

This is *Lucina lintea* Conrad, 1866, and *Lucina nassula* Conrad, 1846. It is not the shell intended by Guppy, under the name of "*nasuta* Conrad," which is a *Jagonia*, but Conrad has not described any *Lucina nasuta*.

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[1] See Proc. U. S. Nat. Mus. XII, 1889, p. 263, pl. XIV, fig. 13.

[2] Idem, 1889, pl. XIV, figs. 6, 7.

[3] See Report on Porto Rico shells, p. 493, 1901, pl. VI, fig. 13.

PHACOIDES (LUCINISCA) MURICATUS Spengler, 1798.

Florida Keys and West Indies, with adjacent coast, in 6 to 12 fathoms. (Pacific coast??)

This is *Tellina muricata* Spengler, 1798; *T. imbricata* Chemnitz (1799?); *Lucina scabra* Lamarck, 1818, but not *Tellina* (=*Lucina*) *scabra* of Chemnitz and Dillwyn, 1817; and *Lucina scobinata* Recluz, 1852. It is very easily recognized by its spinose radial sculpture prevailing over the concentric portion, while in the preceding species the reticulation is nearly uniform and the spinosities not prominent.

PHACOIDES (PSEUDOMILTHA) FLORIDANUS Conrad, 1833.

West coast of Florida from Charlotte Harbor to Cedar Keys, and westward to Corpus Christi, Texas.

Surface with rather rude concentric growth stages and a pale papery periostracum; the shell usually flat and rather heavy. It was described as a *Lucina* and referred by Tryon (1872) to *Loripes*.

PHACOIDES (LUCINOMA) FILOSUS Stimpson, 1851.

Casco Bay, Maine, south to Cape Florida, in 16 to 528 fathoms.

This is the *Lucina radula* Gould, 1841, but not of Montagu, 1803; and the *L. contracta* De Kay, 1843, not of Say, 1824. It has been united, erroneously, with the *Phacoides borealis* Linnæus, by several authors. It is a cold-water shell, and is found in increasingly greater depths as it passes southward.

PHACOIDES (LUCINOMA) BLAKEANUS Bush, 1893.

Massachusetts Bay to Cape Fear, North Carolina, in 18 to 464 fathoms.

Very close to the preceding species, but more quadrate, more sparsely lamellose, and with a relatively shorter anterior adductor scar, and shallower sulcus for ligament and lunule.

? PHACOIDES (LUCINOMA) BOREALIS Linnæus, 1766.

Iceland. European seas. Northeast America?

This is the *Venus borealis* of Linnæus in 1766, but not of Gmelin, 1792; the *Venus spuria* of Gmelin, 1792; *Tellina radula* Montagu, 1803; *Lucina alba* Turton, 1822, and *Thiatira spuria* Gray, 1847. This species has been reported from the east and west coasts of America by Carpenter, Cooper, and others, but the nearest authentic record is Iceland, on the authority of Steenstrup. The others are doubtless due to confusion with related but not conspicuously similar species.

PHACOIDES (CALLUCINA) RADIANS Conrad, 1841.

Cape Lookout, North Carolina, and south to Florida, Bermuda, and Porto Rico, in 5 to 85 fathoms, living, dead valves in 287 fathoms.

This is *Lucina radians* Conrad, 1841, and *Lucina radiata* of Conrad in his Medial Tertiary, 1845, but not *Lucina radians* Deshayes (in Melleville) 1843, which is a *Felaniella*.

PHACOIDES (CALLUCINA) BERMUDENSIS Dall, 1901.

Bermuda, Hartt.

This appears to be *Lucina lenticula* Reeve, August, 1850, not of Gould, June, 1850. I have therefore substituted a new name for the preoccupied term. The specimens which agree very well with Reeve's figure[1] were found incrusted in the limy sand of the beach and no living ones have come to my notice. It is not the species catalogued by me in 1889 as *L. lenticula*.[2]

PHACOIDES (PARVILUCINA) CRENELLA Dall, 1901.

Cape Henry, Virginia, south to Cuba, in 2 to 124 fathoms.

This is *Lucina crenulata* Dall,[2] but not of Searles Wood, 1840–1853, or Conrad (1834), 1840.

PHACOIDES (?) LENTICULUS Gould, 1850.

Rio Janeiro (?) United States exploring expedition, under Wilkes.

This is *Lucina lenticula* Gould, 1850 (not of Reeve). A dubious species of which the type is lost, the locality uncertain, and which is erroneously called *Cyclas* on Gould's plate.

PHACOIDES (BELLUCINA) AMIANTUS Dall, 1901.

Cape Lookout, North Carolina, south to the West Indies and to San Sebastian, Brazil, in 2 to 640 fathoms, living.

This is the *Lucina costata*,[2] of Dall, 1889, but not of d'Orbigny, 1846, or of Tuomey and Holmes, 1856. A very elegant little species, the analogue of *Lucina cancellaris* Philippi, of the Pacific coast. Living specimens have been found on the reefs among the Florida Keys by Hemphill and also dredged in 640 fathoms, Yucatan Strait, by the U. S. Coast Survey Steamer *Blake*, a very remarkable bathymetrical range.

WEST AMERICAN SPECIES.

PHACOIDES (HERE) RICHTHOFENI Gabb, 1866.

Catalina Island to Gulf of California, in 16 to 66 fathoms.

The analogue of the Atlantic *P. adansonii* d'Orbigny, but with a more capacious lunule. This feature, however, differs considerably at different ages of the same individual, and the young show but little excavation. The young is *Lucina excavata* Carpenter, 1857, not of d'Orbigny, 1851, but not the *excavata* of most west coast collections.

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[1] Conch. Icon., XI, fig. 67.

[2] See Bull. U. S. Nat. Mus., No. 37, 1889, p. 50.

PHACOIDES (HERE) MAZATLANICUS Carpenter, 1857.

Mazatlan.

Carpenter's specimens are so small that it is difficult to be certain about them, but they appear to be a distinct species, allied to the Atlantic *P. sombrerensis*. They are distinguished from young *approximatus* by their dense concentric lamellation.

PHACOIDES (CAVILUCINA) LAMPRUS Dall, 1901.

Gulf of California.

This varies from white to orange color, is concentrically filose, and often has the teeth quite distinct. It is *Lucina excavata* of most of the Pacific coast collections, but not of Carpenter, 1857, or of d'Orbigny, 1851.

PHACOIDES (CAVILUCINA) LINGUALIS Carpenter, 1864.

? Monterey, California. Gulf of California to Acapulco, Mexico.

The Pacific analogue of the Atlantic *P. trisulcatus* Conrad. Valves were collected at Monterey by Gabb, but they were probably adventitious, as no other collector has found the species north of the Gulf.

PHACOIDES (CAVILUCINA) PROLONGATUS Carpenter, 1857.

Cape St. Lucas.

A miniature of the preceding, with exaggerated obliquity. It appears to be rare, and I have seen only worn valves.

PHACOIDES (PLEUROLUCINA) UNDATUS Carpenter, 1865.

Gulf of California.

This is *Lucina undata* Carpenter, 1865, but not of Lamarck, 1818. Since Lamarck's species had been transferred to *Lucinopsis* (= *Mysia*) before the publication of Carpenter's name, the latter need not be rejected.

PHACOIDES (LUCINISCA) FENESTRATUS Hinds, 1844.

Lower California to Panama (and Tumbez, Peru?), in 10 to 30 fathoms.

The finest and largest species of the subgenus, in occasional individuals of which a dwarf anterior right cardinal is perceptible. A young valve, probably of this species, was referred to *Lucina muricata* by Carpenter in the Mazatlan Catalogue, but the latter is not known from the Pacific Coast. *Lucina ochracea* Reeve, 1850, should be compared with this species.

PHACOIDES (LUCINISCA) NUTTALLII Conrad, 1837.

Santa Barbara, California, to the Gulf of California, in 16 to 30 fathoms.

The Pacific analogue of *P. nassula* Conrad of the Gulf of Mexico, but a larger and finer shell. A variety, *centrifugus* Dall, has the concentric sculpture near the beaks sparser, more elevated and fringed with flat spinules, usually worn off; it was dredged in the Gulf in 26 fathoms. Owing to the manner in which the muricate species have been confused with one another, it is difficult to disentangle their distribution from the literature; but I have seen no authentic specimens of this species from south of the Gulf of California.

? ? PHACOIDES (LUCINISCA) MURICATA Spengler, 1798.

"Tumbez, Peru," Reeve; "? Mazatlan" Carpenter.

The synonymy of this species will be found in the east coast list. I have never seen an authentically west coast specimen of this shell. It is not found in any of the faunal publications on this coast except that of Carpenter, and there, only with doubt, is identified from a minute fragment, less than a tenth of an inch long. Reeve's localities are notoriously unreliable. I consider that the presence of this species on the Pacific coast is yet to be demonstrated, but do not feel justified in omitting all reference to it here.

PHACOIDES (MILTHA) CHILDRENI Gray, 1825.

Gulf of California, Cape St. Lucas, Mazatlan.

This large flat species is unmistakable; the locality, Brazil, given in the Conchologia Iconica, is erroneous. The type specimen was described as inequivalve, but the specimens I have seen appear to be entirely equivalve. It was first described as a *Tellina*.

PHACOIDES (PSEUDOMILTHA) TELLINOIDES Reeve, 1850.

Magdalena Bay, west coast of Lower California, south to Guayaquil, in 11 fathoms.

Very like the *M. floridana* Conrad, but more elegant, and with a bright yellow periostracum. It seems to have been at first confused by Carpenter with *Felaniella sericata*, owing to the fact that Reeve's figure is not very characteristic. It was described as a *Lucina*.

PHACOIDES (LUCINOMA) HEROICUS Dall, 1901.

Off West Mexico, in 1,005 fathoms, in latitude 27° 24′ N., Gulf of California.

One of the finest species of this interesting and characteristic group, much larger than *æquizonatus* Stearns, and with a rounder outline.

PHACOIDES (LUCINOMA) ANNULATUS Reeve, 1850.

Sitka, Alaska, and south to San Pedro, California, in 8 to 135 fathoms.

This is the *Lucina borealis* of Cooper, Carpenter, and Gabb, but not of Linnæus; *Lucina filosa* Dall, 1870, not Stimpson, 1851; *Lucina acutilineata* of Gabb and other Californian authors, but not of Conrad, 1849; *acutilirata* "Conrad" of Cooper, 1864, in Carpenter, meaning *acutilineata*. Reeve's figure of his *annulata*, doubtfully referred to California, so exactly represents a young specimen of this species which has bleached or lost its yellowish periostracum, that I have little hesitation in referring it to our shell.

PHACOIDES (LUCINOMA) ÆQUIZONATUS Stearns, 1890.

(Plate XLI, figs. 2, 3.)

Santa Barbara channel, in 276 fathoms; a very distinct subquadrate species.

PHACOIDES (LUCINOMA) LAMELLATUS E. A. Smith, 1881.

West coast of Patagonia, in 10 to 369 fathoms, also in St. Andrews Bay.

A well marked species from the southern extreme of South America, originally described as a *Diplodonta*.

PHACOIDES (EPILUCINA) CALIFORNICUS Conrad, 1837.

Crescent City, California, south to San Diego, in 3 to 15 fathoms; Acapulco?

This is the *Lucina californica* of Conrad, and the young were named *L. artemidis* by Carpenter in 1856. A species unique in its characters among recent shells, but with an analogue in the Tertiaries of the southeastern States.

PHACOIDES (PARVILUCINA) TENUISCULPTUS Carpenter, 1865.

Nunivak Island, Bering Sea, and southward to Catalina Island, California, in 8 to 135 fathoms.

A species of which the metropolis is in the cold waters of the northern coast.

PHACOIDES (PARVILUCINA) APPROXIMATUS Dall, 1901.

Catalina Island, California, and south to Panama, in 5 to 40 fathoms.

Closely related to the last species, but smaller, more delicate, without the anterior right cardinal tooth which is developed in the northern shell, and most abundant in the Gulf of California.

PHACOIDES (BELLUCINA) CANCELLARIS Philippi, 1846.

Cerros Island, west of Lower California, and south to the Gulf and to Panama, in 5 to 30 fathoms.

An elegantly sculptured species, with analogues on the Atlantic coast and in the China seas.

NOTES.—The *Lucina cristata* of Recluz (not of Smith, 1885), is a *Tellidora*, near *T. Burneti* Broderip and Sowerby, but found on the Atlantic coast. *Lucina pulchella* C. B. Adams, 1845, not Grzybowski, 1899, is a *Strigilla*. *Lucina corrugata* Deshayes, 1843, is credited by him to California, but really belongs to the Indo-Pacific fauna, and has been collected at Singapore. It is *Lucina philippinarum* Hanley, 1850. *Lucina sulcata* Reeve, 1850, which has some external similarity to *Loripes clausus* Philippi, is regarded by Mr. E. A. Smith as identical with *L. argentea* Reeve, from the Moluccas, and appears to have the characters of *Phacoides*. *Lucina caribæa* d'Orbigny, of Beau's catalogue of the shells of Guadeloupe, is apparently a *nomen nudum*, as I have not been able to find any description of it in the literature.

A *Lucina oerstedti* of Mörch is listed from the West Indies in the Poulsen catalogue, but it is probably a manuscript name, and no shell so labeled now appears in the Poulsen collection at Christiania, according to Dr. Collett.

Genus DIVARICELLA von Martens, 1880.

This is *Cyclas* of Mörch, 1853, not of Lamarck, 1799; *Egraca* (sp.) of Leach, 1852; *Lucinella* Monterosato, 1883; *Loripes* and *Lucina* (sp.) of various authors. Type, *D. angulifera* von Martens = *Lucina ornata* Reeve, 1850, not of C. B. Adams, 1852, Mauritius.

This genus is divisible as follows:

Section *Divaricella* s. s.

Valves suborbicular, convex, subequilateral, with inconspicuous beaks, no dorsal areas, two cardinal teeth in each valve, the laterals variable, the posterior distant, usually obsolete; the anterior feeble, adjacent; ligament and resilium set in a groove, but not internal, the excavated striæ forming an angle on a line radial from the beaks. Type, *D. ornata* Reeve.

Section *Pompholigina* Dall.

Valves extremely tumid, the umbones subspiral, the teeth cyclodont, anterior and posterior dorsal areas indicated. Type, *Lucina gibba* Gray, W. Africa.

Section *Bourdotia* Dall.

Valves very inequilateral, subquadrate, the anterior end produced, the anterior dorsal margin concavely arcuate; a single minute cardinal in each valve; laterals obsolete; the excavated external sulci arcuate, not angulate. Type, *Lucina Bourdoti* Cossmann, 1882, Parisian Eocene.

Subgenus **Lucinella** Monterosato, 1883.

Shell like *Divaricella*, but the ligament obsolete and the resilium wholly internal, as in *Semele.* Type, *Lucina commutata* Philippi, 1836, = *Tellina divaricata* Linnæus, 1758; Mediterranean and western Europe.

LIST OF THE AMERICAN SPECIES.

DIVARICELLA QUADRISULCATA d'Orbigny, 1846.

Nahant Beach, near Boston, Massachusetts, and southward to the West Indies, Rio de Janeiro and Santa Caterina, Brazil, in from 10 to 50 fathoms.

This is (from types) *Lucina strigilla* Stimpson, 1851, and *L. divaricata* of Gould, 1841, and other early writers. It is also the *Lucina americana* of C. B. Adams in 1852; the *Cyclas dentata* of Verrill, 1873, and the *Lucina commutata* Arango, 1878, not of Philippi, 1836. A variety *transversa* Dall, 1901, with the valves disproportionately elongate in the direction of the hinge line, has been dredged in 22 fathoms off Cape Lookout, North Carolina, by the U. S. Fish Commission.

This species is distinguishable from the next by its longer, small and narrow, somewhat sinuous lunule and fine crenulation of the interior margins. The adult has no denticulations of the outer margin due to the external sculpture.

DIVARICELLA DENTATA Wood, 1815.

Cape Hatteras, North Carolina, south to the West Indies (and, according to d'Orbigny, to Brazil), in 10 to 60 fathoms.

It is the *Lucina divaricata* of many of the early writers, but not of Linnæus; but not the *Lucina dentata* of Defrance, 1823; the *L. serrata* of d'Orbigny, 1846; the *L. chemnitzii* of Philippi, 1848, and the *L. pilula* C. B. Adams, 1852 (young shells), are synonymous.

It may be known by its very small, deep, cordate lunule at any age, and in the adult it differs from *D. quadrisulcata* by its greater size and the denticulation of the lateral and dorsal margins by the external sculpture. The large specimens have a tendency to obsolescence noticeable in the teeth, and the laterals are often quite imperceptible.

DIVARICELLA EBURNEA Reeve, 1850.

Cape St. Lucas, Lower California, and southward to Panama.

It is the *Lucina eburnea* of Reeve, 1850, but not of Deshayes, 1835. It may be distinguished from the Antillean *D. quadrisulcata* d'Orbigny by its shorter, wider, and cordate lunule, and by the well-developed lateral teeth, which are well marked and distinct at all ages. The sculpture is also usually more arcuate.

DIVARICELLA PERPARVULA Dall, 1901.

Cape St. Lucas, Lower California, south to Guacomayo.

This is the *Lucina pisum* of Philippi in April, 1850, but not of

Reeve (=*seminula* Gould, 1861, but not of Deshayes, 1858) in November, 1850; nor the *L. pisum* Sowerby, 1837, nor the *L. pisum* d'Orbigny of 1841.

It is a small, globular species, with rather sparse external sculpture, more tumid than the young of *D. eburnea*. The specific name has been used so many times for different species of *Lucina*, *senso lato*, that it seems best to substitute a new one to avoid confusion. It has been found, adventitiously, at Monterey, California, by Gabb, with other exotic species.

NOTE.—The *Lucina digitalis* Krebs, 1864, not Lamarck, 1818, appears to be the *Strigilla pisiformis* of Linnæus. The *Lucina pulchella* C. B. Adams (Proc. Boston Soc. Nat. Hist., II, p. 10, 1845, but not of Agassiz, 1845) was also founded on *Strigilla pisiformis*.

? Family CORBIDÆ.

Genus CORBIS Cuvier.

This comprises *Gafrarium* (sp.) Bolten, 1798; *Corbis* Cuvier, 1817; *Fimbria* Megerle, 1811, but not of Bohadsch (*Nudibranchiata*) 1761; *Idothea* Schumacher, 1817, but not of Fabricius (crustacea) 1793. The type and sole recent species is *Venus fimbriata* Linnæus, 1758, + *Fimbria magna* Megerle, 1811, + *Idothæa perforata* Schumacher, 1817. It is a native of the China seas, from which several varieties have been described.

The generic name of Bolten, meaning a waffle iron, in allusion to the cancellate external sculpture, was applied to an assembly comprising one species subsequently made the type of *Corbis;* five species subsequently included in *Circe* Schumacher; and one peculiar *Venus* (*V. reticulata* Linnæus) which will have to retain the name if it be retained at all. We arrive, by the method of elimination, at this result, which, fortunately, is more convenient than to throw out names so universally accepted as *Corbis* or *Circe*.

In the Yoldi Catalogue[1] Mörch lists this species from the Antilles. In the Mazatlan Catalogue Carpenter[2] describes a minute shell which he suspected to be the young of a species of this genus, but to which he prudently gave no specific name. Mörch's reference is certainly erroneous and no confirmation of Carpenter's suspicion has been received, though collections in the Gulf of California have continued to be made for nearly half a century. The genus is represented in our early Tertiaries, but does not appear to have survived into the Miocene. I see no reason for supposing that it forms a member of the recent fauna on either of our coasts.

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[1] Volume II, 1853, p. 33.

[2] 1857, p. 101.

Family CYRENELLIDÆ.

The shells of this group, with a Lucinoid animal and Diplodonta-like shell, exhibit a hinge structure which is wholly distinct from any other of the Lucinacea. They are of brackish or fresh water situs and confined, as far as known, to the borders of the subtropical Atlantic and the Tertiaries of the southern United States.

Genus CYRENOIDA Joannis.

This is *Cyrenoida* Joannis, June, 1835, *Cyrenella* Deshayes, Feb., 1836, and *Cyrenoides* Sowerby, 1842. Type, *C. dupontia* Joannis, Senegal.

Shell thin, inflated, suborbicular, with a brownish or yellowish periostracum, concentrically feebly striated; adductor scars subequal, elongate-ovate, the anterior projecting very little into the area within the pallial line, internal margins not crenulate; hinge with a long external ligament enfolding a smaller resilium; right valve with two, and left with one ⊏-shaped cardinal laminæ, the ventral one in the right valve shorter and more compressed, the "hooks" or shorter limbs of the laminæ tending to be sulcate or bifid. There are no laterals. The original type appears to have had a defective hinge, as the figure of this part of the shell given by Joannis is erroneous.

CYRENOIDA AMERICANA Morelet, 1851.

Cuba and Porto Rico, in the deltas of streams.

More transverse than the African species and with a more delicate hinge and less prominent umbones.[1]

CYRENOIDA FLORIDANA Dall, 1896.

Brunswick, Georgia, south to the Everglades of Forida, and in west Florida, north to Charlotte Harbor and vicinity, in brackish marshes.

Smaller and more delicate and less quadrate than the Porto Rico species.

A much larger species occurs in the Pliocene of the Caloosahatchie beds of Florida, and has been named (1896) *C. caloosaënsis* Dall. It reaches a length of 31 mm.

NOTES AND DESCRIPTIONS OF NEW SPECIES.

THYASIRA BISECTA (Conrad).

(Plate XL, fig. 8; plate XLII, fig. 5.)

Figures are of a recent specimen with a length of 50 mm., which was dredged southeast of Alaska Peninsula in 69 fathoms, mud, the bottom temperature being 44° F. The younger specimens dredged at the same time show no essential differences except of size. Another specimen from 135 fathoms in Puget Sound measures 74 mm. in extreme length and about 28 mm. in diameter. I have seen some fossil specimens which attained even larger dimensions. The shell recalls *Megaxinus rostratus* (Pecchioli) in almost every respect, but the distal ends of the nymphs do not project as strongly as in that species.

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[1] See Porto Rico Report, pl. vi, fig. 5.

THYASIRA CONIA Dall and Simpson.

(Plate XLII, fig. 2.)

As this came to hand too late to be figured in the Porto Rico report, I give a figure of the species here from the largest specimen obtained in the vicinity of San Juan Harbor, in 310 fathoms, by the U. S. Fish Commission.

THYASIRA EXCAVATA, new species.

(Plate XXXIX, figs. 12, 15.)

Shell subovate, thin, white, with a pale yellowish periostracum; sculpture of concentric incremental lines, and in each valve three sharp and two or three obscure radial ridges. Beaks small, subacute, not prominent, distinctly prosogyrate; lunule and escutcheon well developed, elongate, rather narrow, and emphatically excavated, bounded by a well-marked carina, which in the case of the escutcheon is high, thin, and sharp, separated from another less acute radial keel by a wide, deep sulcus; on the disk near the middle are two other radials, evident but obscure, and another a short distance behind the lunular carina. The surface occasionally shows a faint dusting of microscopic granulation, which is usually abraded. Valves moderately convex, the interior polished, the hinge edentulous, the nymphs slender and delicate, the ligament narrow and more or less visible externally, the margin of the valve indented by the external ridges. Lon. 20.0, lat. 17.5, diam. 15.0 mm.

Dredged by the U. S. Fish Commission in the Gulf of California, between San Marcos Island and Guaymas, in 1,005 fathoms; bottom temperature, 37°.6 F. Also off Tillamook, on the coast of Oregon, in 786 fathoms, mud; bottom temperature, 37°.3 F.

This species is markedly characterized by the deeply excavated and sharply bounded escutcheon and lunule, in which respect it is not closely approached by any other.

THYASIRA TOMEANA, new species.

(Plate XXXIX, fig. 3.)

Shell moderately convex, subovate, concentrically sculptured with incremental lines and covered by a pale straw-colored periostracum. Lunule small, ovate, lanceolate, moderately impressed; escutcheon long, very narrow, bordered externally by a sharply incised groove; behind this a rather shallow sulcus radiates from the beak, bounded behind by a rounded radial ridge; ligament thin, delicate, set in a narrow groove; margins reflecting the external sculpture, beaks narrow, prosogyrate, inconspicuous. Lon. 14.5, lat. 13.0, diam. 9 mm.

Several valves came up with mud on the anchor from a depth of ten fathoms in the roadstead of Tomé, Chile.

THYASIRA MAGELLANICA, new species.

(Plate XLII, fig. 6.)

Shell small, white, subovate, moderately convex, with rather high and prominent beaks; external surface sculptured with faint incremental lines and shallow, ill-defined radial sulci; lunule small, moderately impressed, but without any well-defined bounding ridges; escutcheon narrow, obscure; just in front of it a shallow sulcus radiates from the beaks to the basal posterior margin; hinge edentulous, ligament feeble. Alt. 4.7, lat. 3.5, diam. 3.0 mm.

A single valve was obtained on the west coast of Patagonia in 194 fathoms, mud, the bottom temperature being 52° F.

This species appears to differ from *T. fuegiensis* Dall by its more elevated form, smaller size, and especially by the position of the posterior radial sulcus, which, though feeble as in that species, is situated much closer to the posterior dorsal margin.

AXINOPSIS SERICATUS (Carpenter).

(Plate XL, fig. 2.)

I have figured a typical specimen of Carpenter's shell for comparison with the following form, and also because the former has never been figured. Both the West American species are more solid shells and have the cardinals much better developed than the *A. orbiculatus* Sars of the North Atlantic. The specimen figured is from Puget Sound, where it was dredged by Dr. Kennerly.

AXINOPSIS VIRIDIS, new species.

(Plate XL, fig. 1.)

Shell small, polished, suborbicular, when fresh covered with a glistening pale-green periostracum, some times exhibiting lighter and darker concentric zones; sculpture solely of fine concentric lines of growth; beaks low, inconspicuous; lunule slightly impressed, but without any bounding sulcus or ridge, small, sublanceolate; escutcheon hardly recognizable, very narrow, and inconspicuous. The part of the lunule belonging to the right valve is slightly larger than the other. The ligament is small and very delicate, but not wholly concealed. The subumbonal tooth of the right valve is prominent and strong, the inflected tooth-like process of the left valve is well developed. Margins of the valves smooth, interior polished, with some obscure radial striæ; muscular and pallial impressions normal. In the animal the hepatic glands project in an arborescent manner from each side of the comparatively insignificant bodymass, the gills are normal and rather small. Alt. of shell 6.0, lon. 6.2, diam. 3.3 mm. The specimen figured is from Iliuliuk, Alaska, in 19 fathoms, mud.

Ranges over the North Pacific region from Bering Strait to Northern Japan on the west and Catalina Island, California, on the south and east, in 5 to 167 fathoms, muddy or sandy bottom.

I have described this shell with some hesitation, as it may prove to be the normally rotund form of which *A. sericata* Carpenter is an oblique and ovate variety, but until this is shown it would seem as if the differences are worthy of systematic recognition. The Carpenterian type measures in alt. 4.5, lon. 4.0, and diam. 2.6 mm.; the beaks are higher and more recurved, the periostracum pale yellowish gray and papery.

DIPLODONTA (TORELLI Jeffreys, var.?) ALEUTICA, new species.

(Plate XLII, fig. 3.)

Shell large, coarse, chalky, with a papery dehiscent periostracum, usually with the exterior more or less eroded; form somewhat longer than high, tumid, equivalve and nearly equilateral, the anterior end of the shell less rotund than the posterior; surface in the adult with rather irregular and marked concentric lines of growth; ligament external, set in a groove, with well-marked nymphs; teeth normal, slender, and delicate, in the adult more or less defective; beaks low and inconspicuous, slightly nearer the anterior end; interior chalky, the margins entire, the posterior muscular impression larger than the anterior. The young are proportionally more elongate and less tumid, with a smooth silky olivaceous periostracum. Lon. of adult, 26.5, alt. 22.0, diam. 14.0 mm.; of young shell (figured), lon. 15, alt. 12, diam. 6 mm. The figured specimen is from 10 fathoms, sandy mud, in Kyska Harbor, Aleutians; the type from 8 fathoms in the same body of water.

The species ranges from the Pribilof Islands to the Aleutian chain and eastward to the Shumagin Islands. It has not been found in the dredgings north of the Pribilof group.

The adult shell looks remarkably like the *D. torelli* Jeffreys, of the North Atlantic and Spitsbergen seas. Owing to their usual state of erosion it is difficult to compare adults, but the young of *D. torelli* has a coarsely wrinkled, yellowish periostracum and a rougher surface than that of *aleutica*. The ranges of the two are separated by an immense distance, but, whether due to analogous environment or congenetic origin, the adult shells are nearly indistinguishable.

From *D. orbella* Gould this species is easily separable on account of the more rotund and inflated shell, the texture of the shell substance and the more adherent periostracum of the former.

CODAKIA COLPOICA, new species.

(Plate XLI, fig. 4.)

This shell resembles the *C. orbicularis* Linnæus, so much that it has long been confounded with it and the most appropriate description is comparative. The *C. colpoica* when compared with *C. orbicularis* of similar size is flatter, with the radical sulci more numerous and the interspatial ridges consequently more numerous, more slender, and more uniform. In *orbicularis* the posterior dorsal area is usually well marked by finer and different sculpture from that of the rest of the disk, and near the dorsal margin the sculpture is frequently subspinose or minutely prickly. In *colpoica* the sculpture of the dorsal part of the shell insensibly merges into that of the disk and if anything is rather smoother. There is also a slightly lurid tint in the exterior white of *colpoica*, while that of *orbicularis* is more purely immaculate and snowy. The most conspicuous character however is in the lunule. This in *colpoica* is rather long and narrow, in *orbicularis*, short, cordiform, and more deeply impressed. In both it is confined to the right valve. In *orbicularis* the hinge teeth are usually more prominent, stouter, and adjacent to each other than in the Gulf species.

The specimen figured is from the Gulf of California, and has a length of 76, a height of 68, and a diameter of 22 mm.

The species has not, so far, been identified from any locality south of Acapulco, though a species of which I have seen no specimens and which may be the same has been reported from Panama and the Galapagos Islands.

Once segregated, this species is unmistakable, but the *orbicularis*, being a very common and supposedly widely distributed shell, is often mixed with it in lots supposed to be wholly West American. West Indian shells are often imported in quantity to West Mexican ports for sale to tourists, and, unless authentically collected by a reliable person, the localities for shells obtained from dealers are always subject to a little doubt.

CODAKIA CUBANA, new species.

(Plate XLII, fig. 4.)

Shell small, thin, subcompressed, whitish, with an obvious pale olivaceous periostracum; surface with a small anterior and larger posterior dorsal area, distinguished by an absence of radial sculpture and the somewhat more prominent concentric lines of growth; the rest of the disk with feeble, nearly uniform radial threads, separated by shallow radial sulci; beaks nearly central, small, recurved; lunule small, narrow, impressed, confined to one valve, usually the right; escutcheon absent, ligament normal but feeble; teeth normal but small and delicate, the laterals tending to obsolescence; adductor and pallial scars normal, the interpallial space with a strong oblique sulcus; interior of the disk more or less radially striate; margins crenulate below. Alt. 17.5, lon. 19.0, diam. 7.5 mm.

Dredged off the coast of Cuba in the Gulf of Mexico, in 84 fathoms.

CODAKIA (JAGONIA) PORTORICANA, new species.

(Plate XXXIX, fig. 6.)

Shell small, plump, oblique, inequilateral, white or yellowish; anterior end larger, produced downward and forward; posterior end shorter and smaller; surface sculptured with numerous radial sulci, separated by wider flattish interspaces crossed by rather regular, moderately separated, concentric elevated threads, the radials obsolete on the inconspicuous dorsal areas; lunule elongated, moderately impressed, escutcheon short, narrow, inconspicuous; beaks high, rather small, apically smooth and polished, prosogyrate; hinge normal, delicate, the laterals in the right valve well developed; ligament feeble, short; interior more or less striate, radially; basal margin finely crenulate. Alt. 6.7, lon. 7.5, diam. 6.0 mm.

The figured specimen, the largest valve obtained, is from San Juan Harbor; smaller ones were dredged in the harbor of Mayaguez.

This inconspicuous little species appears to be rare, and comes nearest to *Jagonia costata* d'Orbigny, than which it is more finely and evenly sculptured, beside being a more tumid and smaller shell. In preparing the Porto Rico report this species was overlooked.

CODAKIA (JAGONIA) MEXICANA, new name.

(Plate XL, fig. 6.)

One of Reeve's figures in the Iconica (fig. 33) appears to represent this species, which is very similar to the West Indian *C. orbiculata* Montagu. I find, however, on careful examination that in the west coast shell the lunule is narrower, longer, and less deeply impressed than in *C. orbiculata*, the shell is more delicate, thinner, and more flattened toward the lower margins, the sculpture is more regular and the concentric threads less crowded, so that while the difference is not great the effect in *C. mexicana* is much more elegant; toward the ends it has the radials stouter and with wider interspaces, and with the sculpture on the dorsal areas less distinct from that on the disk than it is in the West Indian form. It is most commonly labeled *Lucina bella* Conrad, in collections, and by Carpenter was named *L. pectinata*, though it is not the *pectinata* of Gmelin or C. B. Adams. A full-grown specimen measures: alt. 21, lon. 23, diam. 10.0 mm.

CODAKIA (JAGONIA) GALAPAGANA, new species.

(Plate XL, fig. 4.)

Shell of moderate size, moderately convex, white or with a yellowish flush, most conspicuous in the interior and frequently with a ferruginous tinge about the posterior dorsal area. It much resembles *C. orbiculata* Montagu, of the West Indies, but its most conspicuous feature is its somewhat loose and irregular radial sculpture in which the ribs are bifurcate or trifurcate distally, somewhat as in *C. costata* d'Orbigny. The lunule is nearly evenly divided between the valves, the dorsal areas inconspicuous, and the radials on the posterior area have a tendency to become minutely nodulous. The figured specimen is from Indefatigable Island, and measures: alt. 19, lon. 19.5; diam. 9.0 mm. Another has the alt. 21, lon. 23 and diam. 9 mm. It appears to be common on the shores of the Galapagos Islands, but has not been found on the American coast or elsewhere as far as known.

CODAKIA (JAGONIA) CHIQUITA, new species.

(Plate XXXIX, fig. 1.)

Shell small, suborbicular, flattish, of a yellowish white color, with the beaks small, rather elevated and erect but not tumid; sculpture of regular, sublamellose, concentric, rather crowded threads, under which are numerous fine, often nearly obsolete, radial threads frequently bifurcate distally, less prominent on the middle of the disk and absent from the dorsal areas; lunule well impressed, subequally divided between the valves, short and sublanceolate; hinge and ligament delicate, normal, with no visible escutcheon, lateral teeth feeble; interior polished, the margins minutely crenulate. Alt. 9.7, lon. 10.0, diam. 4.5 mm.

This has only been found at one locality on the west side of the lower end of the peninsula of Lower California, nearly abreast of La Paz, in 66 fathoms.

LUCINA PHENAX Dall and Simpson.

(Plate XL, fig. 3.)

This pretty little species was discovered too late to be figured in the Porto Rico report, and I have therefore inserted the illustration of it here. It is of a white color and delicate texture, quite tumid, and so much resembles a *Loripinus* that it would be immediately taken for one, but a careful inspection of the hinge shows that the ligament is external and the hinge that of a typical *Lucina*. The specimen figured is from San Juan Harbor in 5 fathoms and measures: Alt. 8.8, lon. 10, diam. 3.5 mm.

LORIPES CLAUSUS Philippi.

I have some doubt as to the original habitat of this species, as a vessel having West African ballast seems to have been wrecked at Belize, and the Rev. W. A. Stanton collected several dead shells which appear to have come from this ballast, and it is possible this should be included among them. It was originally described with no habitat.

PHACOIDES (LUCINOMA) FILOSUS Stimpson.

(Plate XL, fig. 11.)

The general confusion which has reigned for some time in regard to the Lucinoids of the group typified by this species, and of which *Lucina borealis* Linnæus is a peripheral form, has led to a number of misidentifications by the writer, as well as by Cooper, Carpenter, and others, in the past. The Pacific coast form is so near to *filosus* that when it was not identified with *L. borealis* or the Miocene *multilineatus* the name given by Stimpson to the New England form was almost always applied to it. Though there is quite a range of variation in these species, they can invariably be separated by the characters of the deep, narrow sulcus in which the ligament lies. In *P. filosus* the sides of this sulcus rise perpendicularly on each side of the ligament, forming a high keel, and the sides of the lunule show this in a less, but still a noticeable, degree. In *P. annulatus*, on the other hand, the top of the ligament is as high or higher than the sides of the sulcus in which it lies, and the lunule is similarly shallow. The posterior dorsal margin in *filosus* is generally more arcuate, but this is not an invariable character. In order to illustrate the comparison, figures are given of the interior of a valve of each. In the figure given in Proc. U. S. Nat. Mus., XIII, 1890, pl. XVII, fig. 5, by an error of the draughtsman the anterior adductor scar is incorrectly represented as short. The correct proportion is shown in our present figure.

PHACOIDES (LUCINOMA) ANNULATUS Reeve.

(Plate XL, fig. 10.)

See remarks under the preceding species. The present figure is from a specimen collected at Clayoquot, Vancouver Island, measuring alt. 50, lon. 58, and diameter 19 mm. It is a curious fact that the Miocene *P. contractus* Say more closely resembles the Pacific coast recent shell than it does the living species of the adjacent Atlantic coast.

PHACOIDES (CALLUCINA) RADIANS Conrad.

(Plate XLII, fig. 8.)

Conrad's figure of this species[1] is very poor, and the identification depends upon his specimens rather than his illustration. The same specific name had been chosen by Deshayes for a species of *Diplodonta*, but as these belong in different families and were long since separated, it does not seem as if the specific name need be changed, as was done by d'Orbigny, who called the French fossil *subradians*.

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[1] Fossils of the Medial Tertiary, 1845, pl. XL.

A better figure than Conrad's was given by Tuomey and Holmes, but this being accessible to few students, I have refigured the species from a recent specimen, 20 mm. in height, collected at Pensacola, Florida.

PHACOIDES (CALLUCINA) BERMUDENSIS, new species.

(Plate XXXIX, fig. 5.)

Reeve's figure of *lenticula* in the Iconica fairly well represents this species, though I can not be certain that the shells are identical, since Reeve gives no data in regard to the hinge or interior. His name at any rate is preoccupied, and it is probably best to treat our specimens as new.

Shell small, discoid, suborbicular, white or brownish, equilateral; beaks small and low but acute; lunule long and narrow, moderately impressed; escutcheon and dorsal areas absent or obsolete; sculpture of close, fine, sharp, concentric lamellæ with slightly wider concentrically striated interspaces; there is no radial sculpture; hinge strong, muscular impressions normal, groove for the ligament long, shallow; margins of the shell without crenulation. Alt. 16.5, lon. 17.0, diam. 7.0 mm.

This species somewhat resembles *P. radians*, but is entirely destitute of any radial sculpture, and has a proportionately longer and narrower lunule, less deeply impressed.

PHACOIDES (PARVILUCINA) CRENELLA, new species.

(Plate XXXIX, fig 2.)

The small shells of this type from the Oligocene to the living fauna have been called by the name of "*Lucina crenulata* Conrad," without exception, and their differences ascribed to "variability." Careful study shows in this, as in other cases, that several distinct species should be recognized. The original locality of Conrad's shell is the Miocene of Suffolk, Virginia, where it is found abundantly. With this as a standard the others have been compared. The living shell hitherto confounded with it is represented in the fossil state in the Pleistocene of North Creek, Florida, and Simmons Bluff, South Carolina, the Pliocene of North and South Carolina, and of the Caloosahatchie beds, Florida. It does not appear in the Miocene. In the present fauna it has a wide range. It differs from the true *crenulatus* as follows: It is thinner, more delicate, with a less heavy hinge, more tumid valves, and is generally more equilateral and the beaks more central. *P. crenulatus* has prominent, almost lamellose concentric sculpture, which is frankly lamellar on the ridges of the posterior dorsal area, which are separated by a more marked radial sulcus and have the whole area relatively wider than in *P. crenella;* in the interspaces only is the radial sculpture of *P. crenulatus* visible and it is composed of close-set threads usually uniform and rather strong; *P. crenella* has the concentric sculpture of low, very fine threads or sulci which do not conceal any part of the radial sculpture, which is feebler, less compact, and more inconstant than in the Miocene shell, being frequently almost entirely obsolete. The lunule in the two species is similar, being larger and less impressed in the left than in the right valve. The crenulation of the inner margin of the valves is stronger, closer, and more prominent in the Miocene shell, in harmony with the stronger radial sculpture.

The specimen figured is from Palma Sola, Florida, and measures 6.5 mm. in height, 6.7 in length, and 4.5 in diameter. The *Lucina crenulata* of Searles Wood in the Crag monograph is a species belonging to the same group, but apparently distinct from either of the American forms.

PHACOIDES (PLEUROLUCINA) UNDATUS Carpenter.

(Plate XXXIX, fig. 14.)

A figure of this elegant and hitherto unfigured species is now furnished. The specimen shown is from the Gulf of California, and measures 10 mm. in height. A larger size is common, but our freshest and best specimens are mostly only adolescent.

PHACOIDES (BELLUCINA) AMIANTUS, new species.

(Plate XXXIX, fig. 10.)

This is another case in which allied species have been indiscriminately lumped. Fortunately the name *costata*, which has been generally used for it, is unavailable, leaving us free to name the component species without regard to the original type of Tuomey and Holmes, which is different from that of Holmes in his Pleistocene volume, both being very inadequately figured. Similar species occur from the Oligocene to recent seas and on both east and west coasts of America.

Shell small, solid, white, usually subequilateral with strong sculpture and hinge; beaks variable, usually rather conspicuous; sculpture of about twelve strong, flattish, radial ribs, separated by deep, narrower, channeled interspaces, less distinct basally in senile specimens; the ribs are crossed by numerous adjacent, flat, strap-like threads, which in well-developed specimens seem to bridge the interspaces; dorsal areas large and conspicuous; anterior with two broad wave-like radials, sometimes slightly lamellose; posterior with one slender radial, which, with the boundary rib in front of the area, is conspicuously nodular; lunule small, deeply impressed, ill defined; hinge and muscular impressions normal, strong; inner margins finely crenulate. Alt. 7.6, lat. 8.3, diam. 6 mm. Most specimens are one-third smaller. The varieties are chiefly in asymmetry, some specimens having the beaks very posterior, especially in the young; the radial ribs are sometimes bifurcate distally, and the concentric sculpture varies in strength and condensation. The *P. cancellaris* Philippi is the Pacific coast analogue.

PHACOIDES (HERE) RICHTHOFENI Gabb.

(Plate XL, figs. 7, 9.)

Views of a young specimen from 15 fathoms, gravel, on the north side of Catalina Island, California, are given. The adults have a much more cavernous lunule. The figured specimen measures: alt. 13.0, lat. 14.5, diam. 7.5 mm.

PHACOIDES (CAVILUCINA) LAMPRUS, new species.

(Plate XXXIX, fig. 9.)

Shell of Dosinioid form, solid, nearly orbicular, slightly convex, suffused with yellow or pink, strongest on the interior of the shell, or plain white; beaks subcentral small, prosogyrate, with a small, more or less excavated lunule usually almost confined to the right valve; sculpture chiefly of fine, low, rather sharp, concentric threads with occasional sulci, due to resting stages, near the margin in senile specimens; radial sculpture comprising more or less microscopic striulations and a broad shallow flexuosity of the posterior dorsal area, which is often obsolete; dorsal areas inconspicuous; hinge and muscular impressions normal, basal margins very minutely crenulate. Alt. 23.5, lat. 23.5, diam. 10.5 mm.

The figured specimen is from La Paz, Lower California. This species has long been known in Pacific coast collections as *Lucina excavata* Carpenter, a name preoccupied in the genus, but a camera lucida drawing of his type of *excavata* by Carpenter shows that his type specimen was a young valve of *Here richthofeni*, afterwards described from fossil specimens by Gabb. The amount of excavation of the lunule in *P. lamprus* varies in individuals, and between the two valves. It seems to be relatively greater in the young, contrary to the rule in *richthofeni*. The solidity and thickness of the shell are notable.

PHACOIDES (CAVILUCINA) LINGUALIS Carpenter.

(Plate XXXIX, fig. 7.)

This species, I believe, though abundant in the Gulf of California, has never been figured. Therefore I thought it useful to illustrate it. It is the west coast analogue of *P. trisulcatus* Conrad. *Phacoides* (*C.*) *prolongatus* Carpenter appears to be distinct, from the specimens I have seen, all of which are poor. It is smaller, higher in proportion, and with more prominent beaks.

PHACOIDES (LUCINISCA) NUTTALLII var. CENTRIFUGUS Dall.

(Plate XXXIX, fig. 13.)

P. nuttallii is one of the most attractive of the West American species. Its elegant reticulate sculpture is usually very evenly distributed. Some specimens from the Gulf of California, however, have the concentric sculpture near the beaks more elevated and the lamellæ more widely separated, while the radial sculpture remains unchanged, thus altering the appearance of the shell very materially, especially in rather young specimens. The concentric ridges at the intersections give out little flat unciform scales or spines, extremely caducous and always lost in the adult. The general aspect of this variety is so striking that I have thought it would be useful to name and illustrate it.

The figured specimen is from 26 fathoms, sandy mud, in the Gulf of California and measures 7 mm. in length.

PHACOIDES (LUCINOMA) HEROICUS, new species.

(Plate XLI, fig. 1.)

Shell large, moderately convex, chalky white, with a strong olivaceous periostracum; beaks small, pointed, recurved, not much elevated; dorsal areas indicated by a more emphatic flexuosity than is usual in this group; sculpture of concentric, fine wrinkles and distant, concentric, sharp, elevated lamellæ, continuous over the whole shell; ligament long, strong, in a very shallow groove; lunule long, narrow, rather deeply impressed, its periostracum darker than on other parts of the shell; teeth slender, normal, a feeble anterior left lateral is visible; muscular impressions normal, margins not crenulated. Alt. 65, lon. 71, diam. 27 mm.

This very fine abyssal shell is nearest to the *P. æquizonatus* Stearns (Plate XLI, figs. 2, 3), which is much smaller and more quadrate.

PHACOIDES (PARVILUCINA) TENUISCULPTUS Carpenter.

(Plate XL, fig. 5.)

This unfigured species is now illustrated from a specimen from the typical locality, Puget Sound, which has an altitude of 12 mm.

This is one of the most abundant shells in Alaskan dredgings from over a muddy bottom, usually in 10 to 20 fathoms. Its chalky shell is almost invariably more or less abraded.

PHACOIDES (PARVILUCINA) APPROXIMATUS, new species.

(Plate XXXIX, fig. 4.)

Shell small, tumid, nearly equilateral, white with a yellowish periostracum; beaks high, full, with a rather emphatically depressed lanceolate lunule; sculpture of numerous fine, rounded, usually entire riblets separated by narrow sulci on the disk, but absent from the dorsal areas; concentric sculpture of low, feeble, distant, elevated lines which become feebly lamellose on the dorsal areas; hinge, especially the laterals, strong, normal; muscular scars as usual; basal margin conspicuously crenulate. Alt. 6.5, lon. 6.3, diam. 4.0 mm.

The specimen figured is from the Gulf of California, in 26 fathoms, sand.

In the region south and east of Lower California this species, which is the Pacific analogue of *P. crenella* Dall, is very uniform, but toward the northern extreme of its range the radial riblets on the middle of the disk tend to become obsolete, and then the concentric sculpture is more prominent. This variety does not change its size and never reaches more than one-third the size of the northern *tenuisculptus*, which had doubtless the same genetic origin, judging from the material I have examined. Very conservative persons might prefer to regard the two as extremes of one polymorphic species, but so far I have not found a series which would completely unite them by gentle gradations.

PHACOIDES (BELLUCINA) CANCELLARIS Philipp

(Plate XXXIX, fig. 11.)

This very elegant but hitherto unfigured little shell is now illustrated. It is the Pacific analogue of *P. amiantus* Dall of the Atlantic coast. The specimen figured is from the Pacific coast of Lower California near the southern end of the peninsula, in 26 fathoms, sand, and measures 5.3 mm. in length. It is a shorter shell with fewer ribs than *P. amiantus*, and the nodules on the radials of the posterior dorsal area are longer and more conspicuous.

DIVARICELLA PERPARVULA, new name.

(Plate XXXIX, fig. 8.)

This species being unfigured an illustration of it was thought desirable. The specimen figured is from Acapulco and measures 7 mm. in length.

CYRENOIDA FLORIDANA Dall.

(Plate XLII, fig. 7.)

This species, hitherto unfigured, is now illustrated. The specimen shown is from a salt pond at Boca Ciega Bay, Florida, and measures 14 mm. in length. The average specimens, however, are fully one-half smaller, and are chiefly found buried in mossy vegetation in brackish marshes.

PHACOIDES (PSEUDOMILTHA?) MEGAMERIS Dall

(Plate XLII, fig. 1.)

Lucina (Pseudomiltha?) megameris Dall, Nautilus, XV, 1901.

As this paper is composed of materials toward a monograph of American Lucinacea, it was thought that its interest might be added to by including a figure of the largest Lucinoid known, a hitherto unfigured species, represented by internal casts in the Oligocene of Clairemont, St. Anns, Jamaica, West Indies.

This remarkable fossil, represented by a number of specimens in the U. S. National Museum (Reg. No. 147592), weighs, without any extraneous matter, 7 pounds, and the measurements are: height, 230 mm.; length 235 mm.; diameter, 67 mm.

The largest species hitherto recorded is the *Lucina* (*Pseudomiltha*) *gigantea* Deshayes, from the Parisian Eocene, and that hardly exceeds 80 mm. in its maximum height.

If we except the Tridacnacea and a few Mytilacea, *Phacoides megameris* is one of the largest pelecypods known.

Supplementary note.—Some curious abyssal Pelecypods from the south Atlantic and the Philippines were described by E. A. Smith, in the Challenger Report, under the names of *Cryptodon moseleyi* and *C. luzonicus.* The valves are almost perfectly plain and the hinge edentulous. According to Pelseneer, the anatomy presents the following features: There is a single anal orifice, without valvular or siphonal prolongation; the foot is hatchet-shaped, compressed, and short, with a conspicuous byssal sulcus; the form and arrangement of the adductors recalls *Lepton* rather than *Lucina* or *Thyasira;* the gills have on each side a single direct and reflected lamina, as in *Lucina;* the hepatic and visceral glands are contained within the mass of the body; the anal and peripedal chambers are separated by the union of the gills posteriorly; the anterior edges of the mantle are thickened and specialized for some—not evident—function; the palps are much as in *Diplodonta.*

These two species are obviously not referable to *Thyasira*, and the simplicity of the shell, which recalls *Axinulus*, gives no clue even to the family to which they should be referred. On the anatomical evidence, I propose for them the generic name of *Vaticinaria.*

From *Thyasira* and its near allies, *Vaticinaria* differs by its lucinoid gills and the absence of hepatic digitations, as well as by the specialization of the anterior mantle margin.

From the *Diplodontidæ* (otherwise *Ungulinidæ*) it differs by its lucinoid gills, single siphonal orifice, flattened foot, and edentulous hinge. There is no evidence of any relations with the *Corbidæ* or *Cyrenellidæ.* By this elimination we are obliged to refer the genus to the *Lucinidæ*, of which it is perhaps a degenerate member. It may have lost (as many forms have) much of its character by long residence in the abyssal region. It is least unlike such a group as *Jagonia*, and at any rate can not be referred with propriety to either the *Thyasiridæ* or *Diplodontidæ.*

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EXLANATION OF THE PLATES.

PLATE XXXIX.

FIG. 1. *Codakia (Jagonia) chiquita* Dall; Lower California; U. S. Nat. Mus. No. 96563; lon. 10.2 mm.; p. 823.

2. *Phacoides (Parvilucina) crenella* Dall; Florida; U. S. Nat. Mus. No. 60948; alt. 6.5 mm.; p. 825.

3. *Thyasira tomeana* Dall; Chile; U. S. Nat. Mus. No. 108907; alt. 14.7 mm.; p. 818.

4. *Phacoides (Parvilucina) approximatus* Dall; Gulf of California; U. S. Nat. Mus. No. 96418; alt. 6.5 mm.; p. 828.

5. *Phacoides (Callucina) bermudensis* Dall; Bermuda; U. S. Nat. Mus. No. 41339; lon. 15.5 mm.; p. 825.

6. *Codakia (Jagonia?) portoricana* Dall; Porto Rico; U. S. Nat. Mus. No. 108959; lon. 7.25 mm.; p. 822.

7. *Phacoides (Cavilucina) lingualis* Carpenter; Gulf of California; U. S. Nat. Mus. No. 73687; alt. 12.5 mm.; p. 827.

8. *Divaricella perparvula* Dall; Acapulco, Mexico; U. S. Nat. Mus. No. 120699; lat. 7.0 mm.; p. 829.

9. *Phacoides (Cavilucina) lamprus* Dall; Gulf of California; U. S. Nat. Mus. No. 41626; lon. 17.5 mm.; p. 827.

10. *Phacoides (Bellucina) amiantus* Dall; Yucatan Strait; U. S. Nat. Mus. No. 64276; alt. 7.6 mm.; p. 826.

11. *Phacoides (Bellucina) cancellaris* Philippi; Lower California; U. S. Nat. Mus. No. 96440; lon. 5.3 mm.; p. 829.

12. *Thyasira excavata* Dall; Gulf of California; U. S. Nat. Mus. No. 107449; alt. 21 mm.; p. 818.

13. *Phacoides (Lucinisca) nuttallii* Conrad, var. *centrifugus* Dall, young; Gulf of California; U. S. Nat. Mus. No. 108881; lon. 7.0 mm.; p. 828.

14. *Phacoides (Pleurolucina) undatus* Carpenter; Gulf of California; U. S. Nat. Mus. No. 73685; alt. 10 mm.; p. 826.

15. *Thyasira excavata* Dall; interior of valve represented by fig. 12, *supra*.

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FIG. 1. *Axinopsis viridis* Dall; Unalaska; U. S. Nat. Mus. No. 108925; lon. 6.2 mm. p. 819.

2. *Axinopsis sericatus* Carpenter; type specimen for comparison with fig. 1; Puget Sound; U. S. Nat. Mus. No. 5249; lon. 4.0 mm.; p. 819.

3. *Lucina phenax* Dall and Simpson; Porto Rico; U. S. Nat. Mus. No. 103951; alt. 9.0 mm.; p. 823.

4. *Codakia (Jagonia) galapagana* Dall; Galapagos Islands; U. S. Nat. Mus. No. 102454; lon. 23 mm.; p. 823.

5. *Phacoides (Parvilucina) tenuisculptus* Carpenter; Puget Sound; U. S. Nat. Mus. No. 108827; alt. 12 mm.; p. 828.

6. *Codakia (Jagonia) mexicana* Dall; Gulf of California; U. S. Nat. Mus. No. 101783; lon. 23 mm.; p. 822.

7. *Phacoides (Here) richthofeni* Gabb; young shell from Catalina Island, California; U. S. Nat. Mus. No. 108828; lon. 14.5 mm.; p. 827.

8. *Thyasira bisecta* Conrad (sp.), viewed from above; southeastern Alaska; U. S. Nat. Mus. No. 122556; lon. 50 mm.; p. 817.

9. *Phacoides (Here) richthofeni* Gabb, interior of the valve represented by fig. 7, showing excavation of lunule and muscular impressions.

FIG. 10. *Phacoides* (*Lucinoma*) *annulatus* Reeve, Vancouver Island; interior of shell; U. S. Nat. Mus. No. 150971; lon. 58 mm.; p. 824.

11. *Phacoides* (*Lucinoma*) *filosus* Stimpson; off Newport, Rhode Island; figured for comparison with the preceding; lon. 49 mm.; p. 824.

PLATE XLI.

FIG. 1. *Phacoides* (*Lucinoma*) *heroicus* Dall; western Mexico; U. S. Nat. Mus. No. 108818; lon. 71 mm.; p. 828.

2–3. *Phacoides* (*Lucinoma*) *æquizonatus* Stearns; Santa Barbara Channel, California; interior and exterior of shell; U. S. Nat. Mus. No. 104044; lon. 45 mm.; p. 813.

4. *Codakia colpoica* Dall; Gulf of California; U. S. Nat. Mus. No. 102435; lon. 76 mm.; p. 821.

PLATE XLII.

FIG. 1. *Phacoides* (*Pseudomiltha?*) *megameris* Dall, an internal cast from Clairemont, St. Ann's, Jamaica, West Indies, Oligocene Tertiary limestone; U. S. Nat. Mus. No. 147592; max. length 235.0 mm.; p. 829.

2. *Thyasira conia* Dall and Simpson, Porto Rico; U. S. Nat. Mus. No. 108949; alt. 5.5 mm.; p. 818.

3. *Diplodonta* (*torelli* Jeffreys, var. ?) *aleutica* Dall, young shell; Kyska Island, Aleutians; U. S. Nat. Mus. No. 108845; lon. 15.3 mm.; p. 820.

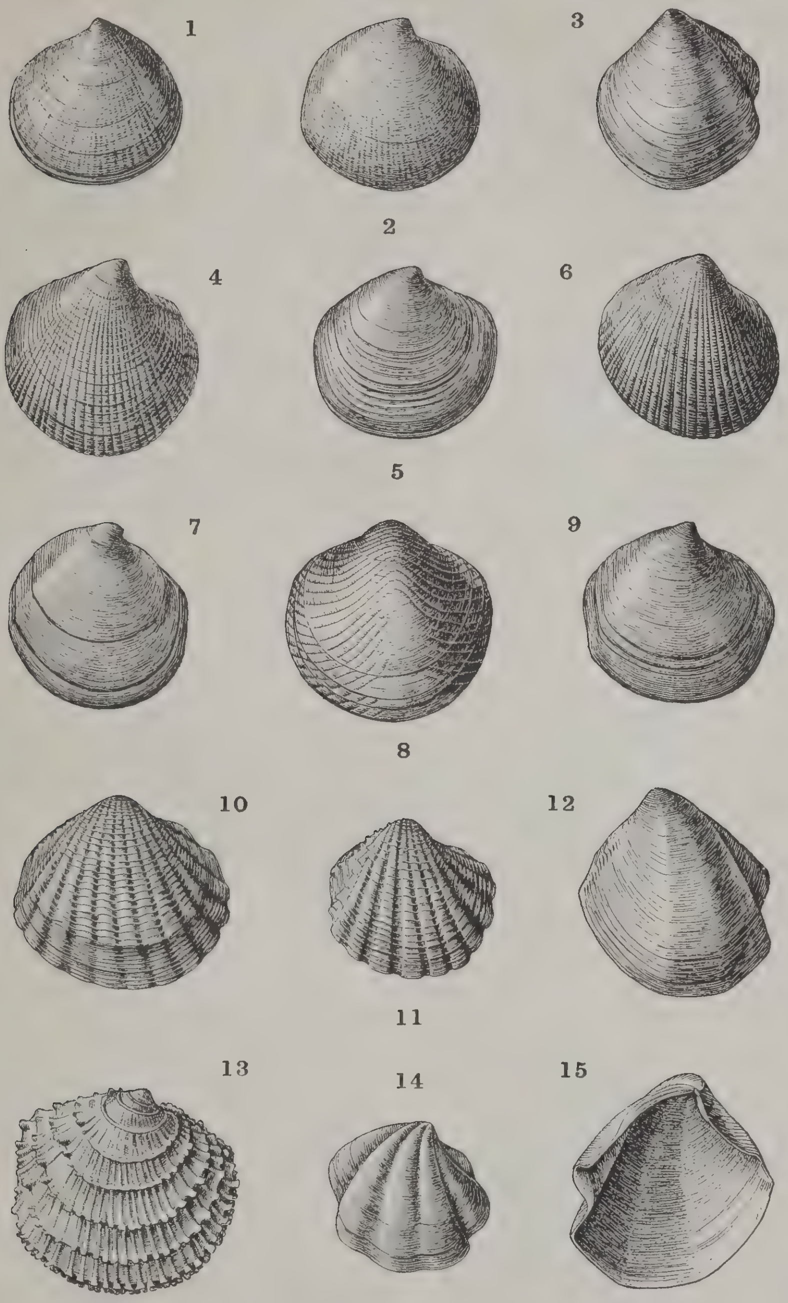
4. *Codakia cubana* Dall, off Cuban coast in the Gulf of Mexico; U. S. Nat. Mus. No. 64279; lon. 18.5 mm.; p. 821.

5. *Thyasira bisecta* Conrad (sp.), Alaska; U. S. Nat. Mus. No. 122556; lon. 50 mm.; p. 817.

6. *Thyasira magellanica* Dall, western Patagonia; U. S. Nat. Mus. No. 122745; alt. 4.7 mm.; p. 819.

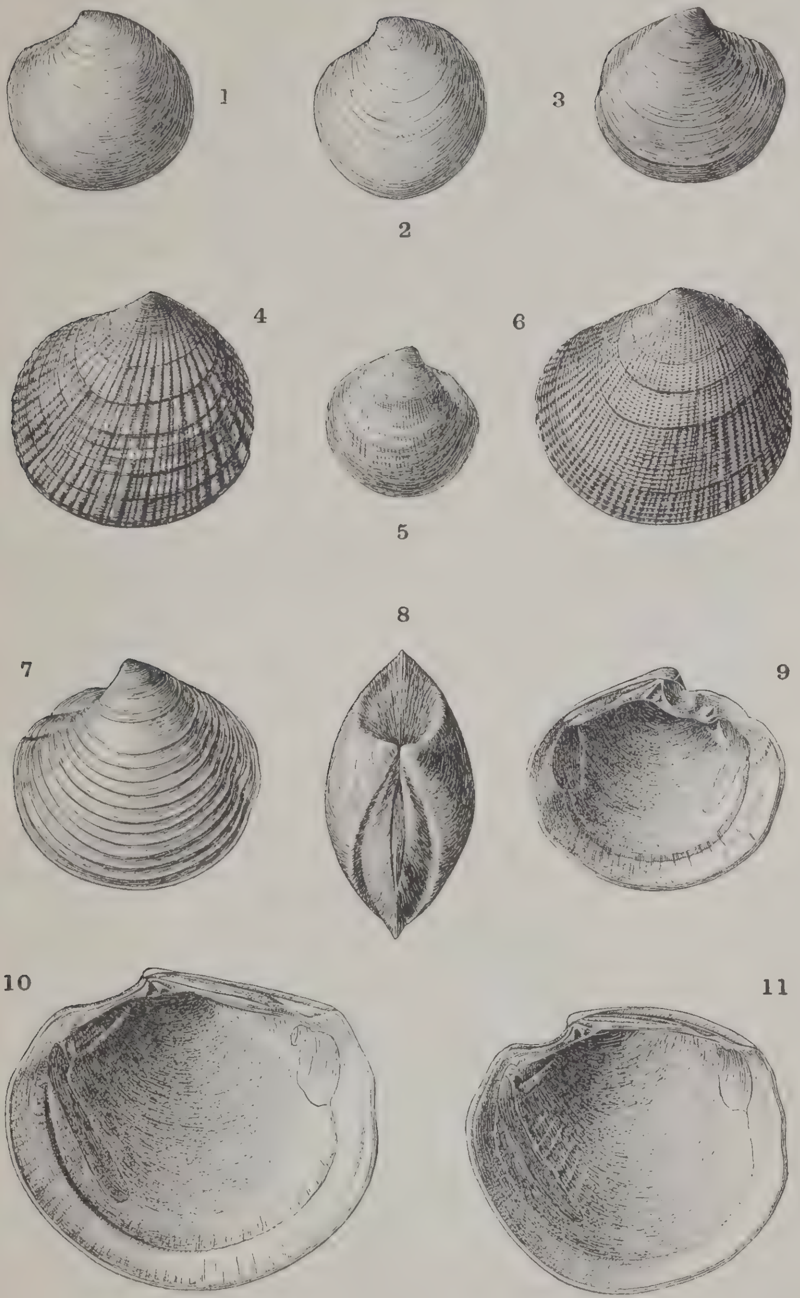
7. *Cyrenoida floridana* Dall, Florida; U. S. Nat. Mus. No. 60973; lon. 14.0 mm.; p. 829.

8. *Phacoides* (*Callucina*) *radians* Conrad, Pensacola, Florida; U. S. Nat. Mus. No. 126914; alt. 20.0 mm.; p. 824.



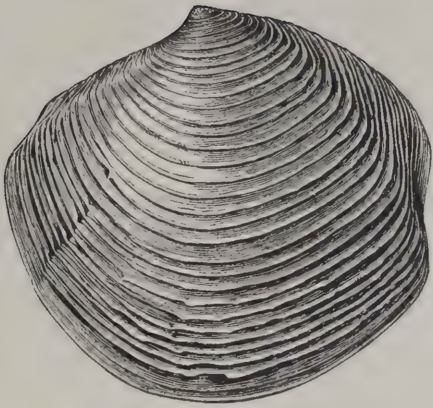
Lucinacea of North America.

For explanation of plate see page 831.



Lucinacea of North America.

For explanation of plate see pages 831, 832.



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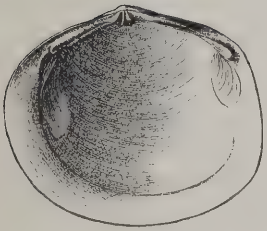

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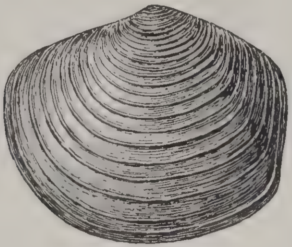

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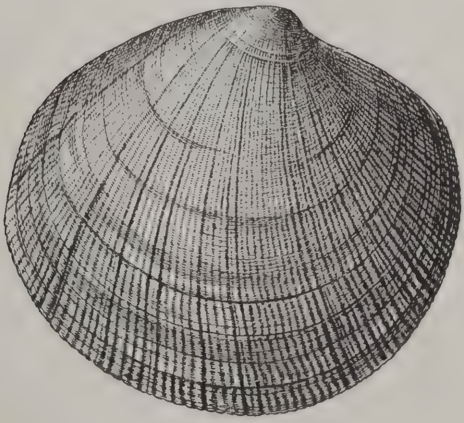
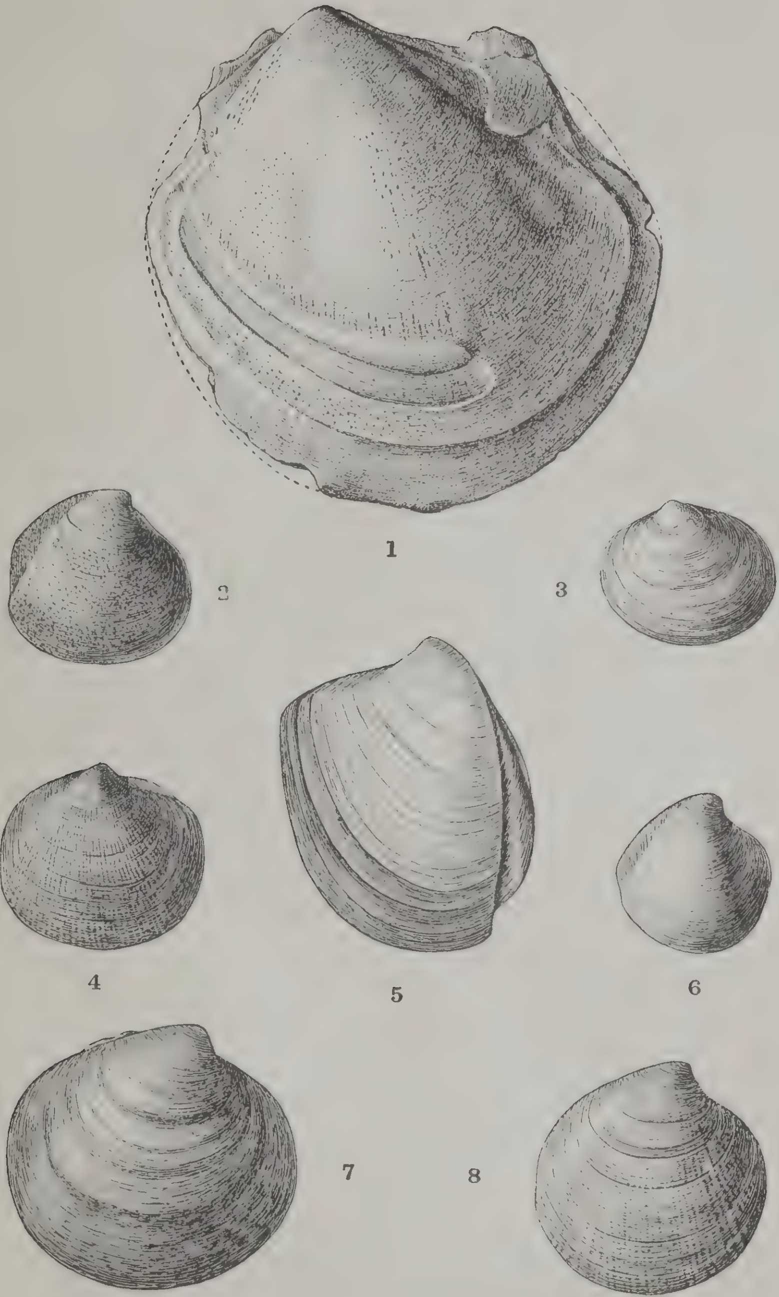


LUCINACEA OF NORTH AMERICA.

FOR EXPLANATION OF PLATE SEE PAGE 832.



Lucinacea of North America.

For explanation of plate see page 832.

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THOMAS MARTYN AND THE UNIVERSAL CONCHOLOGIST

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BY

WILLIAM HEALEY DALL
Curator, Division of Mollusks

No. 1425.—From the Proceedings of the United States National Museum,
Vol. XXIX, pages 415–432

FOR THE INCREASE AND DIFFVSION OF KNOWLEDGE AMONG MEN · PER ORBEM · SMITHSONIAN INSTITVTION WASHINGTON 1846

Washington
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1905

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THOMAS MARTYN AND THE UNIVERSAL CONCHOLOGIST.

By William Healey Dall,
Curator, Division of Mollusks.

The career of Thomas Martyn, the artist publisher of the most beautiful iconography of shells ever prepared, the medalist of a pope and four kings, is little known. He has been confused with a distinguished cotemporary botanist of the same name in some bibliographies, and the facts now discoverable about his life, and even his publications, are disappointingly scanty. In Nichols' Literary Anecdotes (VIII, p. 432) he is styled "the entomologist, a native of Coventry." In the Biographical Dictionary of Living Authors (London, 1815–16) he is described as "an ingenious naturalist in London;" while Dryander, in his catalogue of the library of Sir Joseph Banks (V, p. 347, 1800), has the brief note, "mercator rerum naturalium Londini." The notice in the Dictionary of National Biography (XXXVI, p. 321, 1893) more appropriately refers to him as a "natural history draughtsman and pamphleteer," flourishing between 1760 and 1816. No clue to the dates of his birth and death has been found, but it appears to be certain that he was a resident of London from 1781 to 1816, living successively at 26 King street, Covent Garden, 16 and 12 Great Marlborough street, and 62 Great Russell street, Bloomsbury. His name appears on the list of subscribers to the publication of Da Costa's British Conchology in 1778. Maton and Rackett, in their Historical Account of Testaceological Writers (1804), speak of him as a "dealer," which is also implied by Dryander's note above cited; but if he dealt in anything except his publications these two references are the only traces of it. His name does not appear in a long series of London business and post-office directories of the period which I have consulted. He was evidently a man of education, the language of his text is correct, he knew French, some Latin, and possibly some Greek (there is a Greek subtitle on his frontispiece); he tells us that his work had received the approbation "of many noble and learned persons, and more particularly of Sir Joseph Banks,[a] a sanction, too, given in a manner the most flattering." He was allowed to dedicate his Universal Conchologist to the King, which meant, in those days, that at least he was a person properly vouched for. We may fancy he was not inimical to the Roman faith, since his first copy, or at least the copy among those presented to dignitaries which was earliest rewarded by a medal, was sent to the Pope Pius VI. That he was a man of alert mind, interested in many things, is indicated by the list of his publications, which begins with a quarto essay on ballooning. having a colored frontispiece representing a supposedly dirigible balloon of the author's design. This is followed by the Universal Conchologist; by a pamphlet suggesting a national assessment for the maintenance of disabled soldiers and sailors; by the English Entomologist, including illustrations of more than five hundred British beetles; by a work on spiders, based in part on Albin's original drawings purchased at the sale of the Portland collection in 1786,[b] plates of plants and lepidopterous insects; an anti-Napoleonic pamphlet; and one entitled Great Britain's Jubilee Monitor; the list finally winds up with a new edition of the Natural System of Colors, by the late Moses Harris, edited by Martyn in 1811, a quarto publication dedicated to our own Benjamin West, "the British Raphael."[c]

All this shows a man of alert and original mind, artistic, scientific, philanthropic, and patriotic. The character of the illustrations which have come down to us show that the artistic faculty of Martyn, as regards the representation of objects of natural history, was something quite out of the ordinary. His presence in that part of the Dictionary of Living Authors which was (as indicated by the running date) prepared in 1815, leads to the conclusion that he was then living, and a note in the preface to his pamphlet of 1804 informs us of the existence of a son, who, by the favor of the Duke of York, to whom the pamphlet was dedicated, had been recommended for a commission in the royal army.

The manner of preparing the plates of his iconographies is described by Martyn in the preface to the second issue of his Conchologist, in 1789, and is creditable to his ingenuity.

Finding that considerations of expense and discipline made it impracticable to secure the service desired from independent artists, "he thought it probable that in the productions of boys, all of whom had received their first rudiments of good taste from the same common preceptor, and who should execute whatever they did under his immediate inspection and control, there would generally be found that uniformity and equality of style, conception, and execution which it would be in vain to require from a variety of independent artists." Impressed with this idea, he now directed his attention to the discovery and instruction of "a number of young persons who, born of good but humble parents, could not from their own means aspire to the cultivation of any liberal art, at the same time that they gave indications of natural talent for drawing and design."

---

[a] Banks, who was on excellent terms with George III, may very possibly have procured the royal consent to the dedication of the Universal Conchologist to his majesty.

[b] Portland Catalogue, p. 119, No. 2623.

[c] The first edition, published in the author's lifetime, had been dedicated to Sir Joshua Reynolds. Harris, like Martyn, was an entomologist and artist of no mean capacity, and his British Aurelian has passed through four editions, the last edited by Westwood so late as 1840. Harris is believed to have died about 1785, and his career may have been instrumental in leading Martyn to undertake his own iconographies.

One of this character soon presented himself and made rapid and satisfactory progress, and by the end of a year was sufficiently proficient to serve as a tutor himself, when two more were engaged, and in two years such advances were made that the exhibition of specimen plates excited an admiration the sincerity of which was evinced by orders for copies of the proposed work. At the end of three years from the beginning of the undertaking, seventy copies of the first two volumes (comprising 80 plates) had been completed.

On comparison of the later work with the earlier, however, the latter appeared so inferior that Martyn decided to totally reject the whole of what had been done, and began again, "in that improved style of execution which was ultimately to determine the fate and reputation of the work." Here spoke the artist, and the "dealer," if he existed, totally disappeared with the rejected copies. Finally, the etchings on copper, from which were printed the plates serving as a base for the color work, were taken from outside engravers and made in what he fondly terms his academy, so that the whole work could be prepared in his own establishment.

All this cost money, of course, and Martyn admits having "sunk in it no inconsiderable share of a private competence," but in return he had "the singular gratification of seeing his most sanguine expectations realized by the event," and his publication rendered "as worthy of himself, of his country, and of the learned world as art and his utmost abilities of every kind could effect."

Apart from its product the little academy seems to have been a source of pride to Martyn as furnishing society with an accession of useful members in the persons of his pupils, whose number finally grew to nine, instructed and supervised by Martyn himself, and he winds up his account of it with the declaration that in this little seminary duty toward God and man is earnestly enforced, since the conductor of it "would feel it a nobler boast to have educated one good citizen than any number of artists, however ingenious."

While the essay on a dirigible balloon appears to have been earlier published, the Universal Conchologist seems to have been Martyn's *magnum opus*, and the one to which his interest was most attached. The planning to prepare a work which should be of a unique excellence was done with this special object in mind, and the subsequent publications on insects, spiders, plants, etc., were incidental to the possession of the facilities which had been provided for the conchologist. For his insects Martyn accepted the system of Linnæus, but in his conchological work he projected a system which should be his own, while preserving a binomial nomenclature. He explains[a] that his new classification "will be found to stand on the firm and unalterable basis of truth and nature," his leading idea being to avoid lengthy descriptions by substituting for them figures of such perfection as to convey fully the essential characters of the shells. "Accordingly, the synoptic table," which was to display the scheme of classification devised by the author, "will not appear until sufficient progress shall have been made in the work to prepare the mind of the student for a candid decision on its comparative merits." Meanwhile, to render the work useful from the beginning, "an explanatory table will be given, showing, in different columns * * * the English name and family with an initial letter denoting the genus or division of the family to which the shell belongs, according to the system of the author; thirdly, the Latin name; fourthly, where the shell is found; and lastly, in what cabinet it is preserved."

"The work will commence with the figures of the shells (most of them rare and nondescript) which have been collected by the several officers of the ships under the command of Captains Byron, Wallace, Cook, and others in the different voyages made to the South Seas. The whole of which will be contained in two volumes."

"The author presumes that the method which he has adopted,[b] of displaying the figure of each shell in two positions, would generally be preferred * * * as it would have been impossible, from so small a number as the South Sea shells afford, to select proper companions of the same size and genus to be given in the same plate, and that, too, repeatedly. In future volumes[c] it is proposed to give at least two different shells of the same genus in each plate."

I have already described the organization by which Martyn intended to carry out his plan, the outcome of which is described by Maton and Rackett (1804) in the following remarks:

"In the year 1784 Martyn, a dealer, began one of the most beautiful and costly conchological works this country has ever seen. * * * But before this ingenious artist had completed his two volumes of

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[a] All the citations not otherwise explained are from the text of the introduction and preface to the Universal Conchologist.

[b] In the two volumes above referred to.

[c] That is, in those volumes projected to contain the figures "of every known shell," but of which only two were prepared.

South Sea shells he discovered the impossibility of procuring purchasers sufficient to compensate him for his labour and expense—a misfortune generally experienced by private individuals who embark in such extensive and sumptuous undertakings. He therefore did not proceed beyond 160 plates; which, however, as they include all the species then known to the Southern navigators, may be regarded as constituting a complete work, so far as it goes, and it was all that Mr. Martyn had absolutely engaged himself to execute. There is only one species on a plate, but each is exhibited in different aspects, with incomparable elegance, and with great correctness of drawing and coloring."

The reader will perceive from Martyn's account of the manner in which his plates were prepared—and from an intimation in his introduction that the plates were intended to be arranged when the work was completed, according to his new system of classification—that it was practicable for the author to prepare copies to meet the demand, be the same slow or rapid; also, that mere prudence would lead the author to prepare no great number of sets of plates beyond those for which he had received or expected orders.

This probably accounts for the rarity of the work, and it will be recalled that the first "edition," if it may be so termed, the one which was rejected on account of the want of uniformity in its execution, consisted of only seventy copies of the first eighty plates.

By the citations which follow the reader will see that the bibliographers have been unfortunate or careless in their references to this work, and that the dates of publication, the meaning of the word "volume" when used in connection with these plates, and some other statements in regard to them, are ambiguous or involved in more or less doubt. The citations are given in the order of their dates:

Portland Catalogue, 1786 (*circa* April 1).

The Universal Conchologist, exhibiting the Figure of every known shell, accurately drawn and painted after Nature, with a new systematical arrangement, by Thomas Martyn, 1784.

NOTE.—The compiler of the Portland Catalogue, who is unknown, makes copious references to the figures in Martyn up to plate 80, or by Martyn's estimate volumes I and II, but he assigns to that work the date of 1784, the date of the Catalogue being early in 1786. Dr. Solander, whose manuscript names are thus illustrated by Martyn's figures, without acceptance of Martyn's previously published names, must have obtained the shells and labeled them between the arrival of the expedition late in 1780 and the date of his own death, in May, 1782. The Catalogue is largely based on Solander's manuscript description of the Portland Cabinet, which must have been chiefly prepared before the appointment of Solander as keeper of the printed books in the British Museum, in 1773. The references to Martyn appear to have been added by the anonymous compiler. In looking over the entries in this Catalogue one often finds references to Martini's Conchylien Cabinet, with the name misprinted Martyn. These can, however, be at once discriminated from the references to the real Martyn by the numbers cited for figures, which are invariably larger than 160.

The latest volume of Martini referred to is III, 1777, although nine volumes of the Cabinet had appeared by 1786.

Dryander, Bibl. Banksiana, II, p. 319, 1796; V, p. 347, 1800.

The Universal Conchologist in english and french. Vol. I, pagg. 27, tab. æneæ color. 40. London, 1784, fol. obl.

NOTE.—Dryander took charge of the Banksian Library in 1782 in succession to Solander. He is generally regarded as a very accurate person, though the above title is far from impeccable. It is somewhat odd, considering the relations mentioned between Banks and Martyn, that the library of the former should contain only the first forty plates of the Universal Conchologist, and leads one to wonder if Solander's loyalty to Linnæus and Martyn's rejection of the Linnean classification of shells had anything to do with it.

Maton and Rackett, Linn. Trans., 1804.

Thomas Martin, Universal Conchologist, London, vol. 1, 1784; vol. 2, 1786, fol., with 160 most elegant plates.

NOTE.—It would appear from the above that Maton and Rackett regarded as a "volume," not the 40 plates so denominated in Martyn's own introduction, but the 80 plates which were bound actually into a volume, as in one I have seen in an apparently contemporaneous binding. They are not alone in this view, and it would follow that, if their citation be correct, plates 1–80 appeared in 1784 and 81–160 in 1786.

Dillwyn, Rec. Shells, vol. I, 1817, p. x.

The Universal Conchologist by Thomas Martyn, London, vol. I, 1784, vol. II, 1786.

Chenu, Bibl. Conch. 1ère Ser. tome II, 1845.

Reprint of the French text of Martyn's Introduction and preface, reproduction of his figures on 56 plates, with a brief "avertissment" by the editor, in which he states that the work was published in London from 1769 to 1784, in four folio volumes. The rarity of this beautiful work and the style of its execution, he says, have placed it among the most remarkable books of the epoch, but its costliness and rarity are such that it would be easy to mention all the libraries which possess it; thus in Paris it is only found complete in that of M. Benjamin Delessert (of which Chenu was then custodian); the two first volumes alone in the public libraries and those of some rich amateurs. A second edition, in quarto, was issued in 1789. "Mr. Gray (J. E.), director of the British Museum, has informed me (Chenu) that a fifth volume of the Universal Conchologist exists, but this volume, unfinished by Martyn, has not been published, and the figured species are not even named, so that it forms merely a collection of plates of no scientific interest."

NOTE.—We shall show that Chenu's first date is erroneous. Whether his statement that volumes 3 and 4 appeared by 1784 has any foundation in fact is doubtful; it is at any rate erroneous. The fifth volume spoken of was doubtless a collection of plates which had been prepared after the issue of volume 4, and were on hand when the decision was made to abandon the publication. Chenu's work is useful, notwithstanding a certain number of misprints, but it would have been still more so from our standpoint if he had given a careful bibliographic collation of the complete set in the Delessert library.

Englemann, Bibl. Hist. Nat., I, 1846, pp. 182, 462.

(1) Figures of nondescript shells collected in the several voyages to the South Seas. 2 vols., with 80 col. plates. 4°. London, 1764.

(2) *The same*, with 80 original drawings, exquisitely colored. Atlas in folio. London (Bohn). 18£.

(3) The universal conchologist: exhibiting the figure of every known shell, accurately drawn and painted after nature; with a new systematic arrangement (in engl. and french). 4 vols., with 161 plates, comprising 322 figures of shells, colour. by the author. gr. broad in folio. London, 1784.

(4) *The same* (in engl. and french). 2 vols., with 160 colour. pl. of shells in roy. 4°. London (1785 oder), 1789.

(5) Expose succinct de la nature, de l'origine et des progrès d'un établissement particulier, former pour instruire la jeunesse dans l'art d'expliquer et de peindre des sujets d'histoire naturelle (en Anglais et en Franç.). 4°. London, 1789.

NOTE.—The date to No. 1 is obviously incorrect and was perhaps a misprint for 1784. The concensus of the references is that the work appeared both in folio and quarto, which, being merely a matter of paper, is not unlikely to be the case. The date of No. 3 was probably taken from the first title-page of the bound volume, the others being overlooked. No. 4 is bound, as usual, in two volumes; the second corresponds to volumes 3 and 4 of Martyn and appeared not later than 1789, but perhaps in 1786. No. 5 is the preface to this second half of the work and was probably distributed as an advertisement of the whole publication. On the whole, Englemann's citations give the impression of data obtained at second-hand, with a praiseworthy endeavor to get as much as possible, though unable to verify it in detail.

Carpenter, P. P., Rep. Brit. Assoc. for 1863, p. 517, 1864.

Thomas Martyn, Universal Conchologist, London, 1784.

NOTE.—Carpenter remarks that those who know this work only from Chenu's reprint can form but a poor idea of the exquisite beauty of the original. He notes that it may be consulted at the British Museum, Royal Society, and the Royal College of Surgeons. He cites fifteen northwest American species and gives references to figures in the Conchylien Cabinet, Vols. X and XI, copied from Martyn.

Davies Sherborn, Index Anim., 1902, p. xxxvii.

I. Martyn, Thos. (zoologist), Univ. Conchologist. 4 vols. fo. Lond. With tables, &c.

I. 40 pl. and table. 1784 [not 1769 as often quoted.]
II. 40 pl. and table. 1788.
III. 40 pl. and table. 1789.
IV. 40 pls., table, and 2 pls. of medals. 1792 (?).

[I have seen a unique example of this book, dated 1789, which contains 110 of the 160 plates, bound up with the engraved T. P. and the Dedication to the King. It is uncoloured, shows the plates to be highly finished mezzotints, and has a label on the cover which reads: "About 120 plates | of | figures | of | nondescript shells, | collected in the Different Voyages to the | South Seas | since the year 1764. | By Thomas Martyn. | Price Two Guineas." |]

II. —— Short account of a private establishment. 4°. Lond. 1789.

[This is the "Advert." found in his "Univ. Conch." and contains Born's letters and the plates of medals.]

NOTE.—Considering the stupendous undertaking upon which Mr. Sherborn is engaged, of which the *Index Animalium* is only a preliminary instalment, this is doubtless as full an account as could reasonably be expected. We shall show, however, that the dates probably need some revision. The "unique" collection of uncolored plates is perhaps such a gathering as is responsible for Englemann's entry No. 1, elsewhere alluded to.

National Museum, Sectional Library, Div. Moll., 1905.

Figures | of | non-descript shells, | Collected in the different Voyages to the South Seas | since the year 1764. Published by | Thomas Martyn, | And sold at his House, No. 16, Great Marlborough Street, London. | —— | Des | Figures des Coquilles | jusqu à présent Inconnues, recuillies en | Divers Voyages a la Mer du Sud depuis l'année 1764, | et | données au public, par | Thomas Martyn. | Elles se vendent chez lui au No. 16, Great Marlborough Street, Londres. | MDCCLXXXIX. |

Large quarto, colored frontispiece, not numbered, exhibiting *Turritella terebra* Lam., with the legend *Α*Φ*Ρ*Θ*ΔΙΤΗ*‘; engraved titlepage; engraved dedication to the King (George III); engraved plate of medals, as follows:

I. Obverse, Pivs. Sextvs. Pont. Max. A. VIII; reverse, Sacra. solem. festo. die. S. Pii. V. Augustæ. vindelic. acta. (around the margin); Pius. VI. P. M. præsentia | sua. auxit | MDCCLXXXII. |

II. Obverse, Pivs. Sextvs. Pont. Max. An. IX; reverse, Sacrarivm. basil. Vaticanæ. | A. fvndamentis. extrvctivm | An. MDCCLXXXIII. |

III. Obverse, Iosephvs II Avgvstvs; reverse, Cvrandis. millitvm. morbis. et. vvlneribvs. Academia medico-chirvrgica institvta. Vienæ. MDCCLXXXV.

IV. Obverse, Ferdinandvs IV et Mar. Carolina; reverse, Firmvm imperii fvndamentvm. Neap. CIↃIↃCCLXXVII.

This plate is supplied with the following legend: Aurea Numismata; | Thomæ Martyn, Londinense a Principibus donata in testimonium | favoris et studii quibus novum magnum ejus de Conchis opus acceperunt. | 1788. |

[NOTE.—The date on medal number IV is probably that of the foundation and not of the donation.]

Second plate of medals:

I. Obverse, Carolvs Caroli fil. Philippi Nep. Avgvstvs; reverse, Acclamatio Avgvsta. Matriti. XVI. Kal. Febrvarias. MDCCL XXXVIIII.

II. Obverse, Carolvs IIII, Rex Catholicvs; reverse, Regnorvm regimine svscepto. Matriti. XVI. Kal. Febrvarias. MDCCL XXXVIIII.

The legend to this plate is the same as to the last, except the date, which is 1792.

Two engraved explanatory tables. Bastard title: | The | Universal Conchologist | —— | Le | Conchyliologiste Universel. |

P. [2]. Introduction [in English, reproduced in French on opposite page, ending page 23, page 24 blank]; page 25, subtitle, "Preface;" p. 26 the preface begins as before, English and French, continuing to page 35. Page 36 begins with testimonial letter from Baron von Born, dated Aug. 18, 1787, announcing the receipt of the work and the dispatch of the medal; page 38 continues the reprint of letters, that of June 15th, 1788, acknowledging the receipt of volume second of the shells and proof sheets of the English entomologist; on the opposite pages the text is reproduced in French; page 40 is blank; then follow plates 1 to 80, the plates illustrating one species each and headed fig. 1, etc., instead of plate 1, etc. The two views usually given of each shell are not separately numbered or lettered; the work is delicate etching on copper, colored by hand in the most perfect manner. There is no legend to any of the plates.

The total sums up 81 colored plates, two plates of medals, 1 engraved title page and two engraved explanatory tables, with 38 pages of printed text in English and French, plus two blank pages. The collection is in an apparently contemporaneous binding of tree calf in one volume, trimmed to 11 by 12¼ inches.

I have gone into what may seem to be excessive detail in regard to the plates of medals, because they have an important bearing on the earliest date of issue of this rare work, as will shortly appear.

The copy above described appears to be practically identical with copies in the library of the Academy of Natural Sciences at Philadelphia, and of the Zoological Museum at Berlin, the latter being the subject of a paper by E. von Martens.

I have, unfortunately, had no opportunity for consulting the original of the volumes called III and IV by Martyn, and my knowledge of them is confined to the information I have been able to derive from Chenu's reprint and the literature. However, they are of less importance than volumes I and II. In the absence of an explicit statement from the author as to the date when copies of the first 80 plates were distributed, it becomes necessary to rely upon collateral and circumstantial evidence on this point.

We may begin by pointing out that the first and second forty plates both contain illustrations of shells from the northwest coast of America, chiefly King George's Sound, on the southwest side of Vancouver Island, better known as Nootka Sound. The expedition of Cook, by which these shells were collected, was the first to collect or explore the fauna on this part of the coast. The expedition arrived in Bantry Bay, August, 1780, on its return, and sailed thence for England; so it is evident that these shells could hardly have come into the hands of Martyn for figuring before the autumn of 1780. This fixes a date anterior to which his plates could not have been made, to say nothing of being published. Owing to the manner in which his plates were made, it is obvious that (admitting that they were bound by the purchaser, as usual) variations might be expected in the number found between one pair of covers; and that the extra plates of medals were engraved and added to the others without reference to the time when the first regular plates might have been issued.

It is admitted on all hands that the first forty plates were issued as early as 1784, and the citations in the Portland Catalogue show that eighty plates were published and in use at the time, April, 1786, when that catalogue was issued; moreover, the bibliography included in it gives only the date 1784 for the whole eighty.

Now, Martyn speaks in his preface (p. 34) of his first four medals and states that an engraving of them stands at the head of his preface (also issued separately as an advertisement), and this plate is dated 1788. He also says (p. 26) that at this time it is upwards of seven years since he commenced the design of the work and that a principal inducement was the number of new species he had purchased of several officers "then lately returned from the Pacific Ocean." The expedition returned in the autumn of 1780; seven years and a half would, if deducted from 1788, bring his purchases into the first half of the year 1781. Three years and a half from the time of beginning, Martyn tells us, "upwards of 70 copies of two volumes (80 plates) were finished." This would bring the date of conclusion to 1784, which agrees with the record.

It is highly improbable that any one would proceed in the expensive duplication of copies without to some extent advertising the project, and, in accordance with a custom not yet wholly extinct, it is evident he did so by sending copies to certain dignitaries—the King, the Pope, and various foreign monarchs. The copies were doubtless, in accordance with common sense, of the best he had, perhaps finished by his own hand.

The testimony of the medals shows that he received a medal for two successive years from Pope Sixtus, which we may assume represented his "volumes" I and II, or the first and second forty plates, which therefore were in existence, respectively, in 1782 and 1783.

After rejecting the bulk of the plates finished by 1784 in order to bring the earlier made ones up to the standard of the later drawings, there is a pause in the sequence of the medals, the next being dated 1785, which would correspond well enough to the time needed to bring the series up to standard.

A year later if we accept Maton and Dillwyn's authority, the second eighty plates was ready. Then, in an endeavor to push the work, stimulate sales and avoid losses, a new preface was written, with a plate showing the medals, and testimonials from Baron Born, the celebrated custodian of the Imperial Museum at Vienna, a new title-page was engraved, the whole sent out together, or the preface and medal plate as a circular together; and last of all, in 1792 the subsequent medals were engraved for the second plate, in what seems to have been a vain attempt to make the sales pay the expenses. Martyn's "Psyche," of which the U. S. National Museum possesses the first two numbers, issued in 1797, though the plates are good, is in a much less ambitious and artistic style of coloring, but even that seems to have died of inanition.

I think there is no reason to suppose that any part of the shell plates of the Universal Conchologist were delayed until 1792, the date of the second medal plate, which was probably added to sets in stock as an advertisement.

Maton and Rackett, writing in the lifetime of the author, and Dillwyn, only a few years later than Martyn's last publication, both state that there were two volumes, one issued in 1784 and the other in 1786, in all containing 160 (really 161) plates. The latter date may have been taken from an advance copy, but in default of other evidence must be allowed to stand.

A point to which I wish to urge attention is that Martyn and his bibliographers have not always used the word "volume" in the same sense—the work being, as it appears, issued in two batches of eighty plates each, for the most part, and these batches binding conveniently into two volumes. Where Martyn, as in his prospectus, counted forty plates as a volume and the whole as four, his bibliographers have been prone to regard the work, in accordance with the binding, as composed of two volumes only.

I am not aware of any other copies of the Universal Conchologist in America than the one I have described and a similar copy in the library of the Academy of Natural Sciences, Philadelphia, but possibly some of those naturalists in Europe who have access to the libraries of Rome, Vienna, Paris, Madrid, or London may be able to furnish at first hand some additions or corrections to the account I have given above.

Martyn, like most of the early writers, was ambitious to propose a system of his own, which he intended to give in full, with diagnoses, at the close of the work. Owing to the cessation of publication with the 160th plate, this scheme was never developed. In the two explanatory tables to the first eighty plates the place in Martyn's system to which each genus belonged is indicated by a lower-case letter following the trivial name in the first column of the table. In the second eighty plates, according to Chenu's reprint, these indicatory letters are omitted. The plan was given up. The cost of making the work cover all the known species of shells proved prohibitory. The fifth proposed volume, of which Dr. J. E. Gray once possessed some proof plates, was never issued and the system never made public.

The only discussion of Martyn's work as a whole which I have found in the literature is contained in an article by E. von Martens in the Malakozoologische Blätter (VII, pp. 141–148, Aug., 1860). This author does not investigate the question of dates or editions and seems not to have grasped the inwardness of the puzzling arrangement of the lettering on the explanatory plates. He comes to the conclusion, since there are no definitions and since Martyn did not accept some of the Linnean genus names, that, therefore, we should reject Martyn's names for genera, while his specific names may stand. This conclusion is obviously not in accordance with present methods of treating nomenclature and can not be accepted. According to our current code of rules for such matters, the names of both categories must stand or fall together.

In the main Martyn accepted the Linnean generic names. A few names proposed by prelinnean authors, especially Rumphius, are preferred to those of the illustrious Swede. Some of the Linnean names are used for different groups from those which they originally covered, and a few names, familiar in prelinnean literature but practically new in a systematic sense, are employed in this work for the first time binomially. The writer took the trouble to arrange the various genera as indicated by the letters above referred to, hoping to get an outline of Martyn's larger grouping, but found the result so unsatisfactory as not to repay the trouble. The only influence the book should have on contemporary nomenclature is connected with a few names for the first time used binomially in its tables. The arrangement of the names in the tables is at the first glance a little puzzling, but a small amount of careful study soon enables one to understand it.[a]

The first name used is *Alata* of Klein and other nonbinomial authors (*Strombus* Linnæus), and it is applied to *Strombus pacificus* Swainson, the *Alata aratrum* of Martyn, whose specific name, as long ago pointed out by Mörch, will take precedence.

Buccinum Martyn, is a hotch-potch of Linnean whelks and murices, including species of *Chrysodomus*, *Fusus*, *Struthiolaria*, *Latirus*, *Purpura*, *Acanthina*, etc., but a good many of his specific names have been accepted. *Bulla* Martyn, as far as indicated by his first species, equals *Hydatina* (*physis* Linnæus), but he would doubtless have included all the Linnean Bullas (=*Bullaria* Rafinesque, 1815).

Clava Martyn as first used contained a *Vertagus* and a *Potamides*. By taking his first species as the type, as I showed in 1892, we are enabled to preserve *Cerithium* Bruguière 1789, not Lamarck 1799. The type is *C. asper* Linnæus (+*rugata* Martyn).

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[a] See page 429, *postea*.

Cypræa Martyn is identical with *Cypræa* Linnæus plus *Ovula* Bruguière. *Patella* Martyn is identical with the Linnean genus as far as his species indicate.

Mitra Martyn is identical with *Mitra* Rumphius, usually cited as of Humphrey or Lamarck. As Martyn was the first to use the name binomially, he should be credited with the genus. His first species is *M. tessellata* Martyn, a name which has been generally accepted.

Martyn's next name is *Limax*, but it is not *Limax* of Linnæus (1758). The former is very heterogeneous and seems to have been intended to contain all land snails not operculate and a variety of holostomate marine forms, as well as species of *Terebra* and *Cantharidus*.

In the Museum Calonnianum the name *Lituus* was adopted from Martyn in a generic sense and *Lituus brevis* Martyn cited as a species. But I believe that the whole name was *Limax lituus* var. *brevis* and that, owing to peculiarities of engraving explained elsewhere in this paper, the author referred to was misled. The name *Lituus* as a genus is expunged from a copy of the Museum Calonnianum in my possession, in a hand supposed to be that of Humphrey or one of his clerks, and another name substituted. Mr. Davies Sherborn came to the same conclusion, in the Index Animalium, and placed *Lituus* Martyn among the specific names.

Helix Martyn begins with (*Amphibola*) *crenata* Martyn, whose specific name should be retained. The group otherwise comprises species of *Turbo* of the subgenus *Marmorostoma*, and does not contain a single species of the forms ordinarily known as *Helix*.

Trochus Martyn is equivalent to *Trochus* Linnæus, but *Voluta* Martyn, which follows, contains only species of *Conus* and one coniform *Voluta* in the Linnean sense, while several typical Linnean volutes are referred to *Buccinum* by Martyn.

Cochlea Martyn, contrary to the usage of his nonbinomial forerunners, is a receptacle for bivalves, like *Venus* and *Cardium*. The only species in volume I is *C. radiata* Martyn, a species of *Meretrix*, which I do not find in the monographs. This being the first binomial use of the name, Geoffroy not coming under that category, it may have to supplant *Meretrix*. In volume II it is used for two species of *Cardium* but in the later volumes *Cardium* is substituted for it, including various *Veneridæ*, *Cardium* (Linnæus), and *Echinochama*.

Haliotis Martyn agrees with the genus as restricted by Lamarck from the Linnean mob.

Purpura Martyn is the first binomial use of the name, used by the ancients colloquially to indicate the muricoid shells from which the Tyrian purple was derived. In harmony with this tradition it is applied by Martyn to a shell which Linnæus would have called *Murex*, and which has been usually known as *Cerostoma foliatum* Martyn, after Carpenter. This is Martyn's only species of *Purpura* in volumes I and II, and hence the type. In 1798 Bolten adopted the same view, and began his list of Purpuras with the group of *Murex trunculus.* There seems to be no doubt that, if any of Martyn's names are valid, *Purpura foliata* must typify the group bearing this ancient designation.[a]

Schumacher, in 1817, was the last of the early writers to maintain this view; it is probable that the influence of Lamarck's Animaux sans Vertèbres was too powerful to be withstood. The shells usually known as *Purpura* will probably take the name of *Thais* Bolten, 1798, as pointed out by Mörch half a century ago.

Martyn's *Mytilus* includes *Modiolaria*, *Mytilus*, and *Modiolus.* This genus was exactly adopted by Bruguière in his plates of the Encyclopèdie Méthodique in 1797, and part of the figures appear to have been copied from Martyn's plates.

Volumes III and IV are less interesting; *Nerita* of Martyn is identical with *Nerita* Linnæus. *Tellina* also agrees with the Linnean genus and *Pecten* Martyn is the same as *Pecten* Müller, 1776. In volume III the volutas (which had been included in *Buccinum* in volume II) are transferred to *Voluta*, which here comprises both the cones and volutes. *Purpura* continues to be a muricoid group. All the species of *Spondylus* figured are called *Ostrea*, but no true oyster is figured. *Oliva* is the same as *Oliva* Bruguière, in 1789, though two oliviform cones have been unwisely included.

To sum up: Martyn uses in the Linnean sense the following Linnean genera: *Bulla*, *Patella*, *Trochus*, *Nerita*, *Tellina.*

He uses the following Linnean names, but not, or not wholly, in the Linnean sense: *Buccinum*, *Limax*, *Helix*, *Haliotis*, *Cypræa*, *Voluta*, *Mytilus*, *Cardium*, *Ostrea.*

He adopts from nonbinomial or pre-Linnean authors, and gives a binomial status to:

Alata (Klein, =*Strombus pars* Linnæus): Type, *A. aratrum* Martyn (sole example). *Purpura* (Fabio Colonna, =*Murex pars* Linnæus). Type, *P. foliatum* Martyn (sole example).

He proposes for the first time binomially and in a sense wholly new:

Clava Martyn, 1784. Type, *Murex asper* Linnæus. Adopted by Hwass, 1797. (= *Vertagus* of Authors.) Adopted by Dall, 1892.

Mitra Martyn, 1784. Type, *M. tessellata* Martyn. Adopted by Hwass, 1797, and Lamarck, 1799.

Cochlea Martyn, 1784. Type, *C. radiata* Martyn. Heterogeneous and not accepted by later authors.

Oliva Martyn, 1786. Type, *O. corticata* Martyn. Adopted by Bruguière, 1789; Hwass, 1797; Cuvier, 1798; Lamarck, 1799.

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[a] See Proc. Biol. Soc. Wash., XVIII, 1905, p. 189.

Of the above *Mitra* derives from Rumphius, 1705; and *Oliva* probably from *Olea* Argenville, 1757. How he came to apply *Cochlea*, which had always been used for some form of gastropod, to a group of bivalves remains a mystery.

I close this discussion by giving a list of the species figured by Martyn from his Explanatory tables, those of the first 80 plates from our own copy, those of the second eighty from Chenu's reprint, which is unfortunately more or less marred by typographical errors.

These names are not followed by an authority after the specific name, and they are not all due to Martyn. Some of the species are Linnean, and *Cypræa carneola* derives from Rumphius. Moreover, until one is familiar with the tables the arrangement is sometimes puzzling. The columns are narrow, space limited, and the engraver seems to have had an artistic fervor for keeping his masses 'balanced.' Thus, when a number of species of one genus follow one another, in several cases the generic name is not put opposite the first one, but at the middle of the group with dashes or vacancies above and below. Then again the specific names are not ranked to the right of the column uniformly, but part to right and part to left, to give the column balance and avoid ungraceful lines—a true engraver's trick. To one accustomed to regular columns of type in tabular order the arrangement seems at first glance helter-skelter; but in nearly every case the context, or the indicatory letters of the early plates, enable the puzzle to be solved after a little consideration.

There are 190 specific names and eight varietal names (engraved as trinomials quite in modern fashion) on the explanatory tables. Among the one hundred and ninety regular specific names there are seven compound nouns, such as *pellis-erminea* and *crista-galli;* these were not usually at that date hyphenated as we are now accustomed to do. Linnæus used such names, and they have never been regarded as inconsistent with binominal nomenclature. I have hyphenated these names in the list. There is one case in which the generic name has been accidentally omitted, while the English and French trivial names in the column to the left give no clue, as I have not been able to find either of them in any of the lists of early conchological synonyms.

One of Chenu's entries, number 82, has been so mangled that I can make nothing of it. It was probably *Buccinum vexillum*, the figure representing *Voluta vexillum* of modern authors.

The name *subrubicunda* for a *Tellina* is repeated in the references to plates 156 and 159 in Chenu's reprint. The species are different and probably one of these names should be *rubicunda*. Similar errors can be corrected only by reference to an original copy.

Some one in conversation was disposed to question whether Martyn can be regarded as consistently binomial on account of the presence of the eight trinomials, which are not categorically stated to be varieties. But considering that there is at best no room in the column for even the usual abbreviation of the word "variety," and that the practice in each case is perfectly regular, I think there is no merit in this suggestion. Such authorities as Gmelin, Bolten, Dillwyn, Lamarck, Pfeiffer, Shubert and Wagner, Carpenter, and Stearns have accepted Martyn's names without demur, and, indeed, while looking into the matter I have not anywhere in print found the regularity of his nomenclature questioned except by von Martens.

VOLUMES I AND II.

TABLE I.

Fig.
1. *Alata aratrum.*
2. *Buccin(um) prismaticum.*
3. *aplustre.*
4. *spinosum.*
5. *nodosum.*
6. *fimbriatum.*
7. *striatum.*
8. *maculosum.*
9. *haustrum.*
10. *calcar.*
11. *Bulla virgata.*
12. *Clava rugata.*
13. *(Clava)*[a] *herculea.*
14. *Cypræa carneola.*
15. *(Cypræa) reticulata.*
16. *Patella tramoserica.*
17. *(Patella) ænea.*
18. *(Patella) calyptra.*
19. *Mitra tessellata.*
20. *(Mitra) fasciata.*
21. *(Mitra) sphærulata.*
22. *(Mitra) nexilis.*
23. *(Mitra) versicolor.*
24. *(Limax) opalus.*
25. *Limax fibratus.*
26. *(Limax) echinatus.*
27. *(Limax) lituus.*
28. *(Limax) lituus brevis.*
29. *Limax undulatus.*
30. *Trochus heliotropium.*
31. *inæqualis.*

TABLE I—Continued.

Fig.
32. *Trochus canaliculatus.*
33. *annulatus.*
34. *costatus.*
35. *sulcatus.*
36. *punctulatus.*
37. *granosus.*
38. *bullatus.*
39. *(Voluta) cingulum.*
40. *Cochlea radiata.*

TABLE II.

41. *Buccin(um) striatum.*
42. *laciniatum.*
43. *liratum.*
44. *plicatum.*
45. *succinctum.*
46. *lima.*
47. *saturum.*
48. *linea.*
49. *maculatum.*
50. *calcar-longum.*
51. *nodatum.*
52. *arabicum.*
53. *vermis.*
54. *papulosum.*
55. *scutulatum.*
56. *(Fusus?)*[b] *toreuma.*
57. *Clava maculata.*
58. *(Clava) rubus.*
59. *Cypræa aurantium.*
60. *(Cypræa) tortilis.*

[a] Where the Latin name is omitted for any reason, but indicated by the context, the result is here put in parentheses.

[b] The shell is a *Fusus*, but the Latin name is omitted. It is called crane or grue in the column for English and French names. *Fusus colus* was named the Great Crane shell by DaCosta in 1775, and I find in his other work, and in the Portland Catalogue, various species of *Fusus* referred to as Crane shells.

VOLUMES I AND II—Continued.

Table II—Continued.

Fig.	
61.	*Haliotis iris.*
62.	(*Haliotis*) *pulcherrima.*
63.	(*Haliotis*) *nævosa.*
64.	*Patella personata.*
65.	(*Patella*) *denticulata.*
66.	*Purpura foliata.*
67^{1}.	*Limax nucleus.*
67^{2}.	(*Limax*) *faba.*
68^{1}.	*Limax coccinea.*
68^{2}.	(*Limax*) *purpurata.*
69.	(*Helix*) *crenata.*
70.	(*Helix*) *anguis.*
71.	*Helix staminea.*
72.	(*Helix*) *porphyrites.*
73.	(*Helix*) *smaragdus.*
74.	(*Helix*) *smaragdus minor.*
75.	*Trochus tigris.*
76.	*pulligo.*
77.	*Mytilus cor.*
78.	(*Mytilus*) *canaliculus.*
79.	*Cochlea ovum.*
80.	(*Cochlea*) *corbis.*

VOLUMES III AND IV. (Chenu.)

N. B.—There are many misprints in this reprint by Chenu, most of which, however, are obvious. He does not indicate the original division into tables, if any.

Table III.

Pl.	
81.	*Buccinum ficus.*
82.	*Vexillum broc.* (?)
83.	*Buccinum coronatum.*
84.	*lineatum.*
85.	*tessellatum.*
86.	*nux-odorata.*
87.	*incisum.*
88.	*costatum.*
89.	*scabrum.*
90.	*turris picta.* *turris clavata.*
91.	*galea variatum.* *galea ferrea.*
92.	*ornatum.* *luteolum.*
93.	*vittatum.* *varium.*
94.	*cælatum.*
95.	*Bulla circulata.* *villosa.*
96.	*Cypræa subfuscata.*
97.	*Clava tessellata.*
98.	*nigra.* *fusca.*
99.	*Patella scapula.*
100.	*testudinata.*
101.	*morionis-pileus.*
102.	*umbrella.*
103.	*Mitra rugata.* *denticulata.*
104.	*staminea.* *fasciata.*
105.	*Mitra limosa.* *vermiculosa.*
106.	*Nerita nux-castanea.*
107.	*acupictus.*
108.	*diversicolor.*
109.	*pellis-erminea.* *hebræa.*
110.	*stellatus.* *fasciatus.*
111.	*Oliva corticata.* *striata.*
112.	*interpuncta.* *fenestrata.*
113.	*Purpura scabra.* *senticosa.*
114.	*tubulata.* *ramosa.*
115.	*Limax aureus.*
116.	*tiara.*
117.	*lampas.*
118.	*vittatus.*
119.	*scaber.*
120.	*serpens.*
121.	*spicatus.* *fusca.*
122.	*flammeus.*
123.	*scutulatus.*
124.	*Trochus petrosus.*
125.	*Voluta fagina.* *cosmographia.*
126.	*reticulata.*
127.	*undata.* *interpuncta.*

VOLUMES III AND IV—Continued.

Table III—Continued.

Pl.	
128.	*Voluta ducis-navalis.*
129.	*scutulata.*
	zonaria.
130.	*Cardium bicolor.*
	nexilis.
131.	*tigrina.*
	aquosa.
132.	*crista-galli.*
	hystrix.
133.	*implexa.*
	purpurea.
134.	*triangularis.*
	coccinea.
135.	*dentrachalis.*
136.	*nimbata.*
	marmorata.
137.	*cœlata.*
	arborescens.
138.	*kussa.*
	palatum.
139.	*undatum.*
	fumosa.
140.	*nebulosa.*
141.	*castrensis.*
142.	*virgulata.*
	inscripta.

Table III—Continued.

Pl.	
143.	*Cardium albida.*
144.	*viminea.*
145.	*acupicta.*
	maculosa.
146.	*columbina.*
147.	*striata.*
148.	*gilva.*
149.	*violacea.*
150.	*personata.*
151.	*Mytilus fuscus.*
	viridis.
152.	*viridis undata.*
	fuscus undata.
153.	*Pecten rubidus.*
	bombycinus.
154.	*Ostrea echinata.*
155.	*spinosa.*
156.	*Tellina cinnamomea.*
	subrubicunda.
157.	*alba.*
	rosea.
158.	*barbata.*
159.	*subrubicunda* (?).
	purpura.
160.	*adumbrata.*
	rubescens.

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NOTES ON JAPANESE, INDOPACIFIC, AND AMERICAN PYRAMIDELLIDÆ

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Vol. XXX, pages 321-369, with Plates XVII-XXVI

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By William Healey Dall,
Curator, Division of Mollusks,
AND
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Assistant Curator, Division of Mollusks.

While gathering material for the monograph of Pacific coast Pyramidellidæ on which the authors of the present paper have been for some time engaged, application for material for study was made to the Königliche Zoologische Museum in Berlin, where the types of many of the species treated of in the second edition of the Conchylien Cabinet were known to be preserved.

Through the kind intervention of the late Prof. Dr. Eduard von Martens, in charge of the conchological collection of the Berlin Museum, the entire series of their Pyramidellidæ, including numerous types, was lent to the U. S. National Museum for study. This series contained material from many sources, of which the most important were the collections of the late Henry and Arthur Adams, of Pætel, of Dunker, and Hilgendorf. Numerous specimens of species inadequately described by Arthur Adams from Japan were among the most valuable for our work, and the importance of accurately figuring and adequately describing them was evident, as, until such descriptions were made public, no small number of species of the Japanese fauna must remain doubtful.

Though mostly small and to many students uninteresting, the Pyramidellidæ exist in much larger numbers than is generally realized. To obtain a satisfactory view of their specific characters, in most cases the species must be studied under the microscope, and to get accurate figures of these minute creatures enlarged photographs or camera lucida drawings are essential. The difficulty of obtaining these in the present instance was much enhanced by the death of our chief draftsman and faithful collaborator, the late Dr. J. C. McConnell, for

Proceedings U. S. National Museum, Vol. XXX—No. 1452.

whom so far it has been impossible to find an equally qualified successor in line drawing. The figures in the present paper are chiefly enlarged photographs, retouched with careful reference to the specimen. With the exception of the microscopically fine striation, which could in most cases only be indicated on a much larger figure than those given here, it is believed that the figures are exceptionally accurate and complete.

The compilation of a card catalogue of the described species of Pyramidellidæ has shown that the number is much greater than the compilers imagined before undertaking the work; and also that, apart from errors of identification, the specific names used for many of these species have often been repeatedly used, in some cases three or four times over, and of course it has become necessary to replace the preoccupied name in each case by one not previously used in the genus. This will account for the number of new names for old species which occur in the present paper.

The senior author desires to say that his part in this paper has been of an advisory and editorial nature, and that the labor of comparisons, of preparing the diagnoses and comments, and practically the entire text, except the introduction, has been borne by the junior author, to whom the appreciation due on this account should be fully accorded.

The types, except where otherwise stated, have been returned to the Berlin Museum, where they may be consulted by students.

DESCRIPTIONS OF THE SPECIES.

PYRAMIDELLA (LONGCHAEUS) BICOLOR Menke.

Pyramidella bicolor MENKE, Malak. Blätt., I, 1854, p. 28.

Two specimens from the Pætel collection labeled *Obeliscus aclis* A. Adams, Japan, are absolutely identical with specimens of *P. bicolor* Menke, in our collection from Guacomayo, Mexico, and we firmly believe that the locality cited by Pætel is wrong.

PYRAMIDELLA (PHARCIDELLA) HASTATA A. Adams.

Obeliscus hastatus A. ADAMS, in Sowerby Thes., 1854, p. 811, No. 24.

Two shells labeled *Pyramidella pulchella* Dunker, new species (a manuscript name), are in the Dunker collection. There is no locality label with them. The shells are in every way identical with specimens in our collection of *P. hastatus* Adams, from Acapulco, Mexico.

PYRAMIDELLA (PHARCIDELLA) MOFFATI, new name.

Obeliscus clavulus A. ADAMS, in Sowerby Thes., 1854, p. 811, pl. CLXXI, fig. 33, not *Obeliscus clavulus* (Férussac) BECK, Index Moll., 1838, p. 62.

The Pætel collection contains a specimen of this species labeled *Obeliscus achates* Gould, see *crocatus*, Japan. In the aperture of this shell a specimen of *Anachis diminuta* C. B. Adams was firmly wedged, which is at home on the west coast of Central America and Mexico. The *Pyramidella* therefore very likely belongs to the same region. The type of *O. clavulus* A. Adams came from Acapulco, Mexico.

PYRAMIDELLA (TRIPTYCHUS) NIVEUS Mörch.

Triptychus niveus MÖRCH, Mal. Blätt., XXII, 1875, p. 158.

Four specimens in the Pætel collection, labeled *Parthenia cælata* A. Adams, Japan, belong to this species. It is quite likely that the locality cited is wrong, and that the specimens came from the West Indies, the home of *P.* (*T.*) *niveus.*

PYRAMIDELLA (TIBERIA) PULCHELLA A. Adams.

Plate XXV, fig. 4.

Obeliscus pulchellus A. ADAMS, in Sowerby Thes. Conch., 1854, p. 808, pl. CLXXI.

Shell very regular elongate-conic, yellowish-white, marked by two moderately broad, equal spiral zones of brown, one at the periphery, the other on the anterior portion of the base. Nuclear whorls two and one-half, moderately large, smooth, about one-third immersed in the first of the post-nuclear whorls, having their axis at right angles to the axis of these. Post-nuclear whorls polished, flattened, slightly shouldered at the summit, marked only by faint lines of growth; posterior half between the sutures pale yellow, anterior half white, bounded at the periphery by the spiral chestnut band which can be seen at the suture of all the whorls. Periphery of the last whorl slightly angular. Base short, rounded, marked by many lines of growth which are much stronger here than between the sutures; the basal color-band is separated from the columella by a narrow white zone. Aperture subovate, somewhat channeled at the junction of the outer lip and the columella, outer lip thin, apparently not fortified within by varices or spiral lamellæ; columella straight, rather strong, reflected, biplicate, the posterior fold large, lamellar, a little below the insertion of the columella, the anterior one much more oblique and but feebly developed, parietal wall covered by a very thin callus.

The Berlin collection contains four specimens, all from Japan; one, belonging to the Pætel collection is described and figured. It has lost the earlier whorls, the eleven remaining measure: long. 12.2 mm.; diam. 4.6 mm. The other three come from H. Adams.

Another specimen, the nucleus of which is described, is No. 181207 U.S.N.M. This also comes from Japan. It has twelve post-nuclear whorls and measures: long. 11.3 mm.; diam. 4.3 mm.

PYRAMIDELLA (TIBERIA) JAPONICA, new species.

Plate XXIV, fig. 2.

Shell umbilicate, regularly elongate-conic, polished, bluish-white, with a diaphanous spiral band on the middle of the whorls between the sutures. Nuclear whorls two, moderately large, smooth, having their axis at a right angle to the axis of the later whorls, and about one-third immersed in the first of these. Post-nuclear whorls flattened, slightly shouldered at the summit, marked only by extremely fine lines of growth. Periphery of the last whorl angular; base rather short, well rounded, marked by rather coarse lines of growth. Aperture moderately large, suboval (outer lip fractured), showing indications of internal lirations; columella very strong, somewhat oblique, biplicate, the posterior fold lamellar, situated a little below the insertion of the columella; anterior fold weak and very oblique.

The type and only specimen is immature; it has eight post-nuclear whorls and measures: long. 6.1 mm.; diam. 2.8 mm.

The specimen is from the Pætel collection and comes from Japan; it was labeled *Syrnola vitrea* A. Adams.

PYRAMIDELLA (TIBERIA) PUSILLA A. Adams.

Plate XXIV, fig. 6.

Obeliscus pusillus A. ADAMS, in Sby. Thes. Conch., 1854, p. 809, pl. CLXXI, fig. 7.

Shell, small, minutely umbilicate, moderately stout, elongate-conic, milk-white. Nuclear whorls small, two and one-half obliquely immersed in the first of the succeeding whorls. Post-nuclear whorls slightly rounded, decidedly shouldered at the summits and somewhat angulate at the periphery, polished, marked only by lines of growth and extremely minute microscopical spiral striations. The slight peripheral angulations show above the summit of the succeeding whorl and help to render the sutures all the more conspicuous. Base of the last whorl rather long, well rounded. Aperture suboval, posterior angle acute, outer lip thin, columella slightly oblique and revolute, showing only a single fold at the edge. In specimens which have the outer lip fractured, the second, i. e., anterior fold comes plainly into view as well as five internal lirations of the outer lip.

The specimen described and figured is from Japan. It has eight post-nuclear whorls and measures: long. 6.4 mm.; diam. 2.6 mm. This is a small, shining, milk-white species, which might easily be mistaken for a *Syrnola*, on account of the deep-seated anterior fold. Some of the specimens show faint irregular impressed axial lines, which we consider accidental. A. Adams described a species, *Obeliscus eburneus*,[a] which, according to the meager description, appears to differ from *P.* (*T.*) *pusilla* only in having the whorls here and there longitudinally sulcate. If these sulcations are the same as the irregular impressed axial lines seen in specimens of *P.* (*T.*) *pusilla*, then *P.* (*T.*) *eburnea* will have to be placed in the synonymy of *P.* (*T.*) *pusilla*. The Berlin material contains two shells, both from Japan, one of which was obtained from H. Adams, the other belongs to the Pætel collection.

PYRAMIDELLA (TIBERIA) PUSILLA JACKSONENSIS, new subspecies.

Plate XXVI, fig. 8.

There are two specimens of *Tiberia* in the Pætel collection from Port Jackson, Australia, which agree in general with *P.* (*T.*) *pusilla* A. Adams, but are uniformly stouter. We therefore separate them subspecifically under the above name. The type, figured, has eight postnuclear whorls and measures: long. 6.1 mm.; diam. 2.7 mm.

PYRAMIDELLA (TIBERIA) TRIFASCIATA A. Adams.

Plate XXV, fig. 6.

Obeliscus trifasciatus A. ADAMS, Proc. Zool. Soc., 1862, p. 232.

Shell elongate-conic, acuminate, minutely perforate, vitreous, with three rather broad spiral yellow bands, two of which appear between the sutures and the third on the middle of the base. Nuclear whorls two, small, well rounded, smooth, a little more than half obliquely immersed in the first of the succeeding whorls. Postnuclear whorls slightly rounded, moderately shouldered at the summits, polished, marked only by fine lines of growth and microscopic spiral striations, encircled between the sutures by two yellow bands, each of which is about one-quarter the width of the space between the sutures. The whorls are thus marked by a vitreous zone at the summit, then a yellow one, which is followed by another vitreous band, and finally the second yellow zone, which extends to the suture. Periphery of the last whorl well rounded; base rather long, marked with lines of growth and spiral striations as on the spire; the yellow band on the middle of the base is of the same width as the other two. Aperture rather small, suboval, posterior angle acute, outer lip thin, fortified deeply within by five subequal and subequally spaced interrupted spiral lamellæ; columella straight, strong, reflected, armed with two folds, a strong lamellar plait a little anterior to its insertion and a much weaker and much more oblique posterior one; parietal wall apparently without callus.

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[a] Proc. Zool. Soc., 1862, pp. 232–233.

The specimen described and figured is from the Pætel collection and comes from Japan. It was wrongly labeled *Agatha nitidula* A. Adams. The specimen has eight postnuclear whorls and measures: long. 6 mm.; diam. 2.7 mm.

PYRAMIDELLA (TIBERIA) DUNKERI, new name.

Plate XXV, fig. 2.

Odostomia fasciata Dunker, Mal. Blätt., VI, 1860, p. 234; also Moll. Japonica, 1861, p. 17, pl. II, fig. 2; not (*Odostomia*) *Chrysallida fasciata* Carpenter, Cat. Maz. Shells, 1856, p. 423.

Shell elongate-conic, acuminate, perforate, subdiaphanous, marked by two moderately broad golden yellow bands, one encircling the whorls a little posterior to the periphery; the other, which is about double the width of the first, is situated a little anterior to the middle of the base. In addition to these two bands a narrow white zone surrounds the whorls a little posterior to the middle between the sutures. Nuclear whorls two and one-half, small, half embedded in the first of the later whorls, having their axis at a right angle to the axis of these. Postnuclear whorls moderately rounded, decidedly shouldered at the summit, almost tabulated, marked by many faint lines of growth and closely placed microscopic spiral striations, which are equally well developed between the sutures and on the base. Periphery and base of the last whorl well rounded. Aperture small, suboval; posterior angle obtuse, outer lip thin, no internal lirations visible (these may prove to be present when a specimen is ground down); columella slender, reflected biplicate; posterior fold lamellar, situated a little anterior to the insertion of the columella, anterior fold very oblique, weak; parietal wall covered by a mere film of callus.

The type is from Ousima, Japan. It has eight postnuclear whorls and measures—long. 5 mm.; diam. 2.3 mm.

PYRAMIDELLA (COSSMANNICA) ACICULATA A. Adams.

Plate XXIV, figs. 1, 8.

Obeliscus aciculatus A. Adams, in Sowerby Thes. Conch., 1854, p. 809, pl. CLXXI, figs. 21, 36.

Shell elongate-conic, tapering to an extremely slender apex, polished, white, with a slight suffusion of brown at the apex and near the aperture. Nuclear whorls two, large compared with the early postnuclear whorls, helicoid, depressed, smooth, having their axis almost at a right angle to the axis of the later whorls and extending beyond the outline of these on the left side. The first three postnuclear whorls are well rounded, the next five considerably flattened, the rest decidedly obese. The first five are vitreous, but as the shell grows older it gradually becomes milk-white; summits of the whorls closely appressed to the preceding whorl, the appressed portion appearing as a narrow band, which at first sight appears as the suture; this, however, is very inconspicuous. All the postnuclear whorls are marked by fine lines of growth and fine, closely-placed, wavy spiral striations. Periphery and base of the last whorl well rounded, marked by lines of growth and spiral striations as between the sutures. The area immediately adjoining the columella is decidedly depressed, forming a pit, but the axis is not perforate. Aperture auriform, moderately large, oblique; posterior angle acute, slightly channeled at the junction of the outer lip and columella; columella rather strong, very oblique, revolute showing only the lamellar posterior fold when the lip is complete. This fold is situated a little anterior to the insertion of the columella. Parietal wall covered by a decided callus. Specimens having the outer lip fractured show the well-developed, very oblique anterior fold, also seven spiral lirations all of which but the anterior one, which is stronger, are subequal and subequally spaced.

This species enjoys a wide distribution. The Pætel collection contains one specimen from Hawaii, which we figure and which was labeled *Pyramidella variegata* A. Adams, but is certainly not that species. The U. S. National Museum has six shells, No. 76720, from Wallis Island, one of which is here described, and three lots from the Viti Islands: No. 42219, seven specimens; No. 87933, five specimens, and No. 101414, three specimens, all of which are remarkably uniform in appearance. One specimen having the nucleus and fifteen postnuclear whorls measures—long, 17.3 mm.; diam. 4.4 mm.

PYRAMIDELLA (ACTÆOPYRAMIS) EXIMIA Lischke.

Plate XXIII, fig. 1.

Monoptygma eximium Lischke, Mal. Blätt., XIX, 1872, p. 103; also Jap. Meer. Conch., Pt. 3, 1874, p. 59, pl. III, figs. 4–6.

Shell elongate-conic, solid, polished, early whorls white, later ones light chestnut-brown, encircled by subequal spiral zones. Nuclear whorls small, smooth, almost wholly immersed in the first post-nuclear whorl. First four post-nuclear whorls snowy white, the second half of the fifth one tinged with brown, remainder of the whorls brown. All of the whorls are moderately rounded, somewhat shouldered at the summit, sculptured by faint lines of growth and deeply incised, moderately broad spiral lines, of which there are six on the second, seven on the fourth, and on the remaining whorls between the sutures; on the penultimate the posterior incised line becomes obsolete and the flattened raised band therefore doubly as wide. These spiral lines are crossed by very fine, equally spaced axial bars, which lend them a punctate appearance. The space between the incised lines is about four times as wide as the lines, and flattened. Periphery and base of the last whorl well rounded, sculptured like the space between the sutures; incised lines eleven. Aperture large, pyriform, posterior angle acute; outer lip sharp, wavy, showing the incised lines within; columella moderately strong, somewhat curved, and slightly revolute; fold not visible in the aperture; parietal wall covered by a faint callus.

The single specimen described above is in the Dunker collection. It has nine post-nuclear whorls which measure: long. 18.1 mm.; diam. 6.8 mm. This is very likely one of the specimens from the type collection which came from Japan.

PYRAMIDELLA (ACTÆOPYRAMIS) FULVA A. Adams.

Plate XXIII, fig. 4.

Monoptygma fulva A. ADAMS, Proc. Zool. Soc., 1851, p. 222.

Shell elongate-conic, greyish-black. Nuclear whorls decollated. Post-nuclear whorls well rounded, very high between the sutures, scarcely shouldered at the summit, marked by lines of growth, and moderately broad, deeply incised, minutely axially barred spiral lines, of which six occur upon the second to sixth whorl and seven upon the seventh to eighth, between the sutures. The spaces between these lines are flattened and minutely spirally striated. Periphery of the last whorl well rounded. Base somewhat prolonged, sculptured like the space between the sutures, having ten of the deeply incised spiral lines. Aperture large, narrow, suboval, posterior angle acute, columella short, moderately strong, twisted and slightly revolute, with a weak oblique fold near its insertion; parietal wall covered by a thin internal callus.

The specimen described belongs to the Pætel collection and comes from Japan. It has nine post-nuclear whorls which measure: long. 20.3 mm.; diam. 5.8 mm.

P. (*A.*) *fulva* differs from *P.* (*A.*) *eximia* by its more slender form, much higher whorls between the sutures, much less shouldered summits, much more prolonged base, narrower and more elongate aperture, the additional fine spiral striations on the raised portion between the deeply incised spiral lines, and by its color.

PYRAMIDELLA (ACTÆOPYRAMIS) CASTA A. Adams.

Plate XIX, fig. 4.

Monoptygma casta A. Adams, Proc. Zool. Soc., 1851, p. 223; also in Sowerby Thes., 1854, p. 818, pl. CLXXII, fig. 22.

Shell elongate-conic, moderately stout, yellowish-white. Nuclear whorls small, almost completely immersed in the first post-nuclear whorl; the periphery of the last volution only is visible, and this appears at right angles to the axis of the later whorls. Post-nuclear whorls moderately rounded, marked by mere lines of growth and many broad, deeply incised spiral channels, which are almost equal in breadth to the raised spaces bounded by them. These channels are crossed by numerous small axial riblets, which render the edges of the spiral raised bands somewhat crenulate. The spiral raised bands are faintly spirally striated. Ten of these incised channels appear between the sutures on the third and fourth, and eleven on the sixth and the penultimate whorl. The posterior channel is usually a little wider than the rest. Periphery and base of the last whorl well rounded, the latter sculptured like the spaces between the sutures, having twelve incised channels. Aperture suboval, posterior angle acute, outer lip wavy, rather strong and opaque; columella slender, curved and twisted with an oblique, obsolete fold near its insertion, parietal wall without marked callus.

There are two specimens among the Berlin material, both belonging to the Pætel collection and both from Japan. The largest, the one described above, has eight post-nuclear whorls and measures: long. 11.3 mm.; diam. 4.1 mm. The other has seven and one-half post-nuclear whorls and measures: long. 10.5 mm.; diam. 3.9 mm.

This species in general outline recalls *P.* (*A.*) *fulva*, but is much smaller, has many more incised spiral channels, and is white in color.

PYRAMIDELLA (ACTÆOPYRAMIS) LAUTA A. Adams.

Plate XIX, fig. 5.

Monoptygma lauta A. Adams, Proc. Zool. Soc., 1851, p. 222; also in Sowerby Thes., 1854, p. 817, pl. CLXXII, fig. 20.

Shell broadly elongate-conic, subturrited, rather stout, milk-white. Nuclear whorls small, almost completely immersed in the first post-nuclear whorl, only the tilted edge of two volutions is apparent, which indicates that the axis of nuclear whorls is at right angles to the axis of the later ones. Post-nuclear whorls inflated, strongly shouldered at the summit, decidedly rounded, marked by many weak, irregular axial riblets and very strong, broad, angular, incised, spiral channels, which are crossed by many more or less regularly spaced and subequally developed backward slanting axial riblets. These riblets render the flattened and faintly spirally striated, raised spaces between the incised channels feebly crenulated on both edges. Five incised channels appear between the sutures on the second and third whorl and six on the fourth and fifth. Periphery and base of the last whorl well rounded, the latter sculptured like the space between the sutures, with six spiral channels. Aperture quite large, suboval, posterior angle obtuse, outer lip thin, denticulate. The incised spiral channels appear as a chain of squarish areolations within, by transmitted light; columella moderately strong, somewhat twisted and slightly reflected with a subobsolete oblique fold near its insertion; parietal wall covered by a very feeble callus.

The specimen described belongs to the Pætel collection. It is from Japan and has six and three-fourths post-nuclear whorls and measures: long. 7 mm.; diam. 3.3 mm.

PYRAMIDELLA (ACTÆOPYRAMIS) AMŒNA A. Adams.

Plate XIX, fig. 1.

Monoptygma amœna A. ADAMS, Proc. Zool. Soc., 1851, p. 223.

Shell slender, elongate-conic, turrited, milk white. Nuclear whorls small, almost completely immersed in the first of the later whorls, the peripheral portion of the last volution only is visible, which shows that the axis of the nucleus is at right angles to the axis of the later whorls. Post-nuclear whorls very high between the sutures, decidedly shouldered, moderately well rounded, marked by rather coarse lines of growth and deeply incised spiral channels, which are crossed by many regular, quite well-developed, axial riblets. These little riblets divide the channels into regular chains of pits. There are five channels between the sutures on the second and third whorl and six on the following three. The raised portion between the channels is of about double the width of the channel, somewhat crenulated on both margins and faintly spirally striated. Periphery and base of last whorl well rounded, sculptured like the space between the sutures, with nine spiral channels, the raised spaces between them gradually diminishing in breadth toward the umbilical region, which is somewhat excavated. Aperture subquadrate, posterior angle acute, junction of columella and outer lip subchanneled; outer lip somewhat expanded at the outer edge, wavy in outline, rather thick, the incised channels appearing as mere lines within by transmitted light; columella straight, thin, fold not visible in the aperture; parietal wall without callus.

Two specimens are among the Berlin material, both in the Pætel collection and from Japan. The larger one, described above, has seven post-nuclear whorls, and measures: long. 7 mm.; diam. 2.6 mm. The smaller one, labeled *pupoides* A. Adams, has six post-nuclear whorls, and measures: long. 5.4 mm.; diam. 2.3 mm.

This species recalls *P.* (*A.*) *lauta*, but is much more slender.

PYRAMIDELLA (ACTÆOPYRAMIS) PUNCTIGERA A. Adams.

Plate XIX, fig. 2.

Monoptygma punctigera A. ADAMS, Ann. Mag. Nat. Hist., VII, 1861, p. 296.

Shell slender, elongate-conic, milk white. Nuclear whorls two, moderately large, depressed helicoid, obliquely one-half immersed in the first of the later whorls. Post-nuclear whorls very high between the sutures, moderately rounded and shouldered at the summits, marked by rather coarse lines of growth and deeply impressed, equally spaced spiral channels, which are crossed by small, quite regular and regularly spaced riblets. The space between these riblets appears as a pit and the whole groove as a pitted channel. Six channels are present between the sutures on the second to fourth and seven on the last two whorls. Periphery and base well rounded, the latter sculptured like the space between the sutures, crossed by eight spiral channels. Aperture moderately large, subquadrate, ? posterior angle acute, (outer lip fractured), columella moderately strong, twisted, columellar fold not visible in the aperture, parietal wall covered by faint callus.

The specimen above described belongs to the Pætel collection. It has six post-nuclear whorls, and measures: long. 5.4 mm.; diam. 1.8 mm.

The present species in some respects resembles *P.* (*A.*) *amœna* Adams, but is much smaller, much more attenuated, with proportionately much higher whorls.

PYRAMIDELLA (ACTÆOPYRAMIS) DIGITALIS, new species.

Plate XIX, fig. 6.

The Pætel collection contains a young individual labeled "*Monoptygma digitalis* A. Adams," from Japan. We have been unable to find any reference to such a species, and are also unable to make it harmonize with any of the described forms. While we dislike to base a description upon a young individual, we nevertheless feel that the present report would be incomplete without it.

Nuclear whorls small, completely immersed, only the rounded periphery of the last is visible above the first of the succeeding volutions. Post-nuclear whorls three, inflated, well-rounded, shouldered, the second encircled by five and one-half strong, narrow, subequal, and subequally spaced spiral keels between the sutures, separated by spaces about one and one-half times as wide as the keels. These spaces are crossed at regular intervals by backward-slanting axial riblets which are about two-thirds as wide as the spiral keels but not quite as elevated. The axial ribs and spiral keels inclose quite regular, depressed, rhombic areas. There are six spiral keels on the third whorl. Periphery and base well rounded, the latter somewhat produced and excavated near the small umbilical chink, ornamented like the spaces between the sutures, having eight spiral keels. Aperture oval, somewhat effuse at the junction of the columella and outer lip, posterior angle obtuse; outer lip strong, rather thick, showing as many low, rounded lirations within as there are spaces between the keels on the outside; columella strong, armed with a well-developed oblique fold a little anterior to its insertion; parietal wall covered by a thin callus.

The specimen measures: long. 2.2 mm.; diam. 1.3 mm.

PYRAMIDELLA (SYRNOLA) CINNAMOMEA A. Adams.

Plate XXVI, fig. 1.

Elusa cinnamomea A. ADAMS, Proc. Zool. Soc., 1862, p. 237.

Shell slender, elongate-conic, of almost rectilinear outline, polished, yellowish-brown. Nuclear whorls two and one-half, rather large, helicoid, moderately elevated, smooth, having their axis at a right angle to the axis of the later whorls and about one-fourth immersed in the first of them; the periphery of the nucleus extends slightly beyond the outline of the spire on the left side. Post-nuclear whorls quite high between the sutures, flattened, separated by slight sutures marked only by faint lines of growth and numerous extremely fine and closely placed spiral striations. Periphery and base of the last whorl well rounded, the latter rather short. Aperture small, suboval, posterior angle narrow and acute, outer lip thin, columella short, curved, moderately strong, with an inconspicuous oblique fold near its insertion; parietal wall covered by a thin callus.

The specimen described and figured belongs to the Pætel collection and comes from Japan. It has eight post-nuclear whorls, and measures: long. 4.2 mm.; diam. 1.1 mm.

This shell has the aspect of a small, straight *Eulima*.

PYRAMIDELLA (SYRNOLA) BRUNNEA A. Adams.

Plate XXIV, figs. 4, 7.

Obeliscus brunneus A. ADAMS, in Sowerby Thes., 1854, p. 810, pl. CLXXI, fig. 35.
Obeliscus buxeus GOULD, Proc. Bost. Soc. Nat. Hist., VII, 1861, p. 403.

Shell elongate-conic, light brown, shining. Nuclear whorls two and one-half, small, depressed helicoid, polished, having their axis at a right angle to the axis of the latter whorls and about one-sixth immersed in the first of them. Post-nuclear whorls flattened, slightly shouldered, rather low between the sutures, marked only by lines of growth and microscopic spiral striæ. Sutures subchanneled and minutely crenulated. Periphery and base of last whorl well rounded, marked like the spaces between the sutures. Aperture suboval, posterior angle acute; outer lip thin; columella short, somewhat twisted and revolute, bearing a strong oblique fold a little anterior to its insertion; parietal wall covered by a thin callus.

A. Adams's type came from Japan. The above description is based upon two individuals from a lot of four, U. S. National Museum collection, No. 170808, which come from Hirado, Hizen, Japan. The nucleus was described from one specimen and the post-nuclear characters from the most perfect individual in the collection, which belongs to the same lot; this has sixteen post-nuclear whorls, and measures: long. 17, 6 mm.; diam. 4.5 mm. This specimen is a little more slender than the average individual. One, having fourteen post-nuclear whorls, measures: long. 14.2 mm.; diam. 4.3 mm. Some show five well-developed, subequal and subequally spaced interrupted lirations on the outer lip. The fine spiral striations are quite superficial and do not appear on specimens which are somewhat worn. There are two other specimens, No. 130076, in the U. S. National Museum from Japan. Gould's type of *Obeliscus buxeus* is from the China Seas; it is an immature shell of ten post-nuclear whorls and is registered as No. 339. A specimen received from Eastlake, No. 160634, was collected at Hongkong, China. The Berlin collection contains one worn and bleached individual which is lacking a number of the early post-nuclear whorls. It was labeled *Obeliscus bicolor* Menke, California, which of course is an error. *O. bicolor* is a triplicate species = *Pyramidella* (*Longchaeus*) *bicolor* Menke.

PYRAMIDELLA (IPHIANA) LISCHKEI, new species.

Plate XXV, fig. 1.

Shell slender, elongate-conic, subdiaphanous, polished, girdled by two golden-yellow bands between the sutures. Nuclear whorls decollated. Post-nuclear whorls rather high between the sutures, very slightly shouldered and well rounded, marked by rather strong lines of growth and scarcely visible closely placed spiral striations. The posterior band lies somewhat posterior to the middle of the whorl, while the anterior one is somewhat posterior to the periphery, showing therefore, on all the whorls a little above the well-marked suture. Periphery of the last whorl well rounded. Base attenuated. Aperture suboval, posterior angle acute, outer lip slightly expanded anteriorly, without internal lirations, columella reenforced by the attenuated base, and almost enveloped by it, bearing a moderately strong, oblique fold near its insertion; parietal wall covered by a thin callus.

The specimen described above belongs to the Pætel collection and comes from Japan. It has eight post-nuclear whorls, and measures: long. 4.6 mm.; diam. 1.4 mm.

PYRAMIDELLA (IPHIANA) TENUISCULPTA Lischke.

Plate XXVI, figs. 3, 5.

Obeliscus tenuisculptus Lischke, Mal. Blätt., 1872, XIX, p. 102; also Jap. Meer. Conch., III, 1874, pp. 58–59, pl. III, figs. 7–8.

Shell, elongate-conic, sides of the spire rectilinear in outline, pale wax-yellow. Nuclear whorls decollated. Post-nuclear whorls flattened, increasing very regularly in size, slightly shouldered at the summit, separated by well-marked sutures, and marked by faint lines of growth and numerous fine, closely spaced spiral striations. Periphery of the last whorl somewhat angulated. Base very short, well rounded and slightly excavated at the umbilical region, sculptured like the space between sutures. Aperture subquadrate, posterior angle acute, outer lip thin, without internal lirations, columella short, somewhat twisted, revolute, bearing a moderately strong oblique fold a little anterior to its insertion.

The specimen described belongs to the Pætel collection, and is from Japan. It has eleven post-nuclear whorls (the apex and perhaps the first two or three post-nuclear whorls being lost), and measures: long. 10.4 mm.; diam. 2.9 mm. It was labeled *Obeliscus balteatus* A. Adams.

PYRAMIDELLA (STYLOPTYGMA) SEROTINA A. Adams.

Plate XVII, fig. 5.

Syrnola serotina, A. Adams, Proc. Zool. Soc., 1862, p. 234.

Shell very small, elongate-conic, wax-yellow, darker toward the apex. Nuclear whorls one and one-half, rather large, loosely coiled, white, obliquely immersed in the first post-nuclear whorl, i. e., the first post-nuclear whorl encircles the nucleus and is thereby rendered quite large and stands out beyond the general outline of the shell. Post-nuclear whorls polished, moderately rounded, marked by faint lines of growth and here and there by an impressed axial line. Spiral sculpture absent. The first four whorls are marked by a rather broad, conspicuous reddish-brown band which encircles them at about one-third of the distance between the sutures anterior to the summit; on the fifth and sixth whorls this band appears as a faint line. The periphery of the last whorl is also encircled by a pale reddish-yellow spiral zone, part of which can be seen projecting above the well-impressed sutures on the preceding two volutions. Periphery and base of the last whorl well rounded, the latter rather short, marked like the space between the sutures. Aperture subquadrate, posterior angle acute (outer lip fractured), showing several internal lirations; columella stout with a strong oblique fold somewhat anterior to its insertion; parietal wall covered by a thin callus.

The specimen here described belongs to the Pætel collection. It has seven post-nuclear whorls, and measures: long 3 mm.; diam. 1.1 mm.

PYRAMIDELLA (AGATHA) VIRGO A. Adams.

Plate XVIII, fig. 2.

Agatha virgo A. Adams, Ann. Mag. Nat. Hist., VI, 1860, p. 422,
Myonia virgo A. Adams, Ann. Mag. Nat. Hist., VII, 1861, p. 295,
Menestho virgo A. Adams, Ann. Mag. Nat. Hist., VII, 1861, p. 295,
Myonia virgo A. Adams, Ann. Mag. Nat. Hist., VIII, 1861, p. 142,
Amathis virgo A. Adams, Ann. Mag. Nat. Hist., VIII, 1861, p. 304.

Shell elongate-conic, subturrited, milk-white. Nuclear whorls two, small, well rounded, obliquely about one-half immersed in the first post-nuclear whorl. Post-nuclear whorls rather high between the sutures, inflated, well rounded, shouldered, marked by irregular lines of growth which lend the surface a somewhat uneven appearance and many fine, closely-placed wavy spiral striations; sutures strongly marked. Periphery of the last whorl with a faint suggestion of an angulation. Base prolonged, gently rounded, marked like the spaces between the sutures. Aperture elongate-ovate, posterior angle obtuse, somewhat effuse at the junction of the lip and columella; outer lip thin without internal lirations; columella short, curved, with a very strong, acute, oblique fold near its insertion which fuses directly and is continuous with the anterior reflected portion of the columella; parietal wall covered by a very thin callus.

The specimen described was received from Hilgendorf and comes from Japan. It has ten post-nuclear whorls and measures: long. 13.7 mm.; diam. 4.4 mm. There are two other individuals among the Berlin material, both young specimens and both from Japan. *P.* (*A.*) *virgo* A. Adams is the type of *Agatha*; we do not know why Adams changed this to *Myonia* and *Amathis* as we have been unable to find the name preoccupied.

TURBONILLA (CHEMNITZIA) MULTIGYRATA Dunker.

Plate XX, fig. 4.

Turbonilla multigyrata Dunker, Ind. Moll. Mar. Jap., 1882, II, pl. xiii, figs. 18–20.

Shell large, elongate-conic, milk-white. Nuclear whorls three, large, helicoid, moderately elevated, having their axis at a right angle to the axis of the later whorls and scarcely at all immersed in the first of them. Post-nuclear whorls well rounded, the greatest convexity falling a little anterior to the middle between sutures, moderately shouldered, and ornamented by strong, rounded, oblique, flexuose axial ribs, which are somewhat fused at the summit and more so at the periphery. Intercostal spaces rounded, not quite as wide as the ribs, decidedly depressed, terminating suddenly at the periphery. Fourteen axial ribs are present upon the first, eighteen upon the fifth, twenty upon the tenth, and twenty-four upon the penultimate whorl. Suture channeled, periphery somewhat angulate, the summits of succeeding whorls fall a little anterior to the peripheral termination of the depressed intercostal spaces and leave a very narrow smooth band apparent in the suture. Base of the last whorl very short, slightly rounded, with a small depressed area at the columella. Aperture subquadrate, moderately large, posterior angle obtuse, outer lip thin, showing the external sculpture within by transmitted light; columella short, straight, and slightly revolute, with a weak, deep seated, oblique fold near its insertion, which is not apparent in the aperture when this is viewed squarely.

The type comes from Japan, has fifteen post-nuclear whorls and measures: long. 11.5 mm.; diam. 2.8 mm.

TURBONILLA (CHEMNITZIA) DUNKERI Clessin.

Plate XX, fig. 3.

Turbonilla dunkeri Clessin, Mart. Chem. Conch. Cab., 2d ed., Pyram., 1900, p. 257, pl. xli, fig. 3.

Shell elongate-conic, gently tapering, dirty white. Nuclear whorls three, small, decidedly elevated, very loosely coiled, having their axis at a right angle to the axis of the later whorls and scarcely at all immersed in the first of them. Post-nuclear whorls very slightly rounded, almost flattened in the middle between the sutures, rather high, marked by strong, rounded, oblique axial ribs which extend prominently from the summit of the whorls to the periphery. Intercostal spaces about as wide as the ribs, decidedly depressed, extending from the summit to the periphery, where they suddenly terminate. Twelve axial ribs are present on the first, sixteen on the fifth, and twenty-one on the penultimate whorl. These ribs are not at all fused at the summit of the whorls, but remain distinct. At the periphery, however, they do become fused and terminate the depressed interspaces. Sutures subchanneled. Periphery of the last whorl slightly angulated. Base moderately long and gently rounded. Aperture small, subquadrate, posterior angle obtuse, outer lip thin, columella slender, slightly curved and somewhat revolute, having a weak, very oblique, deep-seated fold near its insertion, which is not visible in the aperture when this is viewed squarely.

There are three specimens in the Dunker collection, Clessin's types; they are from Nagasaki, Japan. The largest one of these, the one above described, has eleven post-nuclear whorls and measures: long. 6.2 mm.; diam. 1.6 mm. The smallest one agreeing in every way with the larger specimen, has nine post-nuclear whorls and measures: long. 4.2 mm.; diam. 1.2 mm.

Clessin's figure of this species is so poor that it not only fails in delineating the characters of the species, but is absolutely misleading.

TURBONILLA (CHEMNITZIA) ABSEIDA, new species.

Plate XXI, fig. 4.

Shell large, elongate-conic, milk-white, shining. Nuclear whorls decollated. Post-nuclear whorls decidedly rounded, slightly shouldered and somewhat constricted at the periphery, marked by very strong lamellar oblique axial ribs and deeply impressed intercostal spaces which are about twice as wide as the ribs. The ribs do not fuse at the summit but terminate strongly as cusps, rendering the outline of the summits wavy; they fuse at the periphery and there suddenly terminate the deep intercostal spaces. The type, which has lost the nucleus and perhaps the first three post-nuclear whorls, has fourteen ribs on the first (remaining), sixteen on the fifth, and twenty-two on the penultimate whorl. The summits of succeeding whorls on the later volutions drop a little anterior to the periphery and permit a narrow plain band to appear above the suture. Periphery of the last whorl slightly angulated. Base short, well rounded. Aperture moderately large, subquadrate, posterior angle obtuse; outer lip thin, showing the external sculpture within by transmitted light; columella oblique, revolute, with a weak oblique fold at its insertion.

The type and five additional specimens belong to the Dunker collection and come from Japan. One of these has been donated to the U. S. National Museum, where it is entered as No. 185886. The ten remaining post-nuclear whorls in the type measure: long. 8.4 mm.; diam. 2.3 mm. Another specimen lacking only the nucleus has twelve post-nuclear whorls and measures: long. 8 mm.; diam. 2.3 mm. It is possible that this form may be *Turbonilla perfecta* A. Adams, but this can only be decided when Adams' types shall have been located. His scant descriptions and lack of measurements make positive identification impossible when dealing with *Chemnitzia*, *Turbonilla*, or *Odostomia*.

TURBONILLA (CHEMNITZIA) APPROXIMATA, new species.

Plate XX, fig. 1.

Shell elongate-conic, gently tapering, white. Nuclear whorls decollated. Post-nuclear whorls flattened, slightly shouldered, ornamented by strong, rather narrow, oblique, axial ribs which are distinct at the summit but fuse at the periphery. Twelve of these ribs appear on the first, fifteen upon the fifth, eighteen upon the tenth, and twenty-two upon the penultimate whorl. Intercostal spaces a little wider than the ribs, decidedly depressed, terminating suddenly at the periphery. The summit of the succeeding whorls falls a little anterior to the termination of the intercostal spaces and leaves a very narrow smooth area above the well-marked sutures. Periphery of the last whorl very slightly angulated, base moderately long and well rounded. Aperture moderately large, subquadrate, posterior angle acute, outer lip thin, showing the external sculpture within by transmitted light; columella slender, oblique, somewhat revolute; columellar fold not apparent in the aperture, parietal wall covered by a thin film of callus.

There are two specimens in the Berlin collection, both belong to the Dunker collection and come from Japan; one of these has been donated to the U. S. National Museum and is entered as No. 185887, the other, the type, has thirteen post-nuclear whorls, and measures: long. 8.2 mm.; diam. 2.1 mm.

TUBONILLA (CHEMNITZIA) INFANTULA, new species.

Plate XX, fig. 2.

Shell very small, slender, milk-white. Nucleus prominent, helicoid, with elevated spire, consisting of two and one-half whorls, which are about one-fourth immersed in the first of the later whorls and have their axis at a right angle to the axis of these. Post-nuclear whorls six, moderately rounded and ornamented by strong, oblique ribs, of which sixteen occur upon the first and eighteen upon the penultimate whorl. Intercostal spaces about as wide as the ribs, terminating abruptly at the periphery. Base smooth. Aperture moderately large; outer lip (fractured). This is a young specimen; we add it to make the report complete. It was collected by Hilgendorf in Japan and measures: long. 2.1 mm.; diam. .6 mm.

TURBONILLA (CHEMNITZIA) ACTOPORA, new species.

Plate XX, fig. 6.

Shell very slender, elongate-conic, white. Nuclear whorls small, helicoid, obliquely one-third immersed in the first of the later whorls. Post-nuclear whorls rather high between the sutures, flattened and somewhat shouldered at the summit, marked by rather poorly developed, low, broad, rounded, obliquely slanting axial ribs of which fourteen appear upon the second, sixteen upon the fifth and tenth whorl. On the penultimate these ribs are subobsolete. Intercostal spaces shallow, narrow, terminating at the periphery. Periphery and base of the last whorl well rounded, smooth. Aperture moderately large, subquadrate, posterior angle obtuse, outer lip thin, showing the external sculpture within by transmitted light; columella oblique, straight, somewhat revolute, bearing a low, rounded fold a little anterior to its insertion; parietal wall covered by a mere film of callus.

The Dunker collection contained five specimens of this species, one of which has been donated to the U. S. National Museum, No. 185888, all from Japan. The type has twelve post-nuclear whorls and measures: long. 6.8 mm.; diam. 1.5 mm.

The slender shape and poorly developed sculpture which becomes subobsolete on the last whorl will differentiate this from the other described species.

TURBONILLA (CHEMNITZIA) ACOSMIA, new species.

Plate XX, fig. 5.

Shell rather stout, broadly elongate-conic, gently tapering, milk-white. Nuclear whorls one and three-fourths, planorboid, large, extending somewhat beyond the outline of the spire on the left side, scarcely at all immersed, having their axis at a right angle to the axis of the later whorls. Post-nuclear whorls rather high between the sutures, slightly rounded, somewhat shouldered, ornamented by rather low, broad, rounded, oblique axial ribs (which are badly worn on the first two whorls), the third contains fourteen, the fifth twenty, and the penultimate thirty; these ribs are distinct at the summit, but fuse at the periphery of the whorls. Intercostal spaces narrow, scarcely depressed below the general surface of the shell, extending to the periphery. Sutures well marked. The summits of the last three whorls fall a very little anterior to the termination of the intercostal spaces and leave a very narrow plain band above the suture. Periphery and base of the last whorl well rounded. Aperture subquadrate, somewhat produced and effuse at the junction of the columella and the outer lip; posterior angle acute, outer lip thin, showing the external sculpture within by transmitted light; columella straight, oblique, somewhat revolute, with a very weak, low, oblique fold a little anterior to its insertion.

The type belongs to the Dunker collection and is without definite locality. All the other Pyramidellids in the Dunker collection are from Japan. It is quite probable therefore that this may also be the home of the present species. The type and only specimen has ten post-nuclear whorls and measures: long. 8.4 mm.; diam. 2.4 mm.

T. acosmia is similar in outline and ribbing to *Turbonilla* (*Strioturbonilla*) *secura* = (new name for *Turbonilla obeliscus* Gould,[a] not *Chemnitzia obeliscus* C. B. Adams,[b] = *Turbonilla* (*Strioturbonilla*) *obeliscus* C. B. Adams) from Simons Bay, Cape Town, South Africa, but lacks the fine spiral striæ and is in every way somewhat smaller.

TURBONILLA (CHEMNITZIA) GARRETTIANA, new name.

Plate XXI, fig. 5.

Odostomia sulcata GARRETT, Proc. Acad. Nat. Sci. Philadelphia, 1873, p. 224, pl. III, fig. 46. Not *Turbonilla sulcata* DE FOLIN, 1871.

Shell moderately large, subdiaphanous, bluish white, shining. Early whorls decollated. Later whorls almost flattened, somewhat shouldered at the summits, ornamented with poorly developed, broad, low, almost vertical axial ribs which are strongest at the summit of the whorls and gradually grow weaker toward the periphery. The first three post-nuclear whorls probably are lost. The second of those left has eighteen ribs; the antipenultimate twenty-four and the penultimate twenty-two; on this they are much weaker than on the preceding whorls. Intercostal spaces broad and shallow, scarcely sunk below the general surface of the shell, becoming obsolete toward the periphery like the ribs. Sutures well marked. Base of the last whorl rather prolonged, smooth. Aperture moderately large, suboval, posterior angle acute; outer lip thin, junction of the columella and outer lip well rounded; columella oblique, somewhat revolute, provided with a prominent fold, a little anterior to its insertion; parietal wall covered by a thin callus. The sixteen remaining whorls measure: long. 7.3 mm.; diam. 2.1 mm.

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[a] Proc. Bost. Soc. Nat. Hist., VII, 1861, p. 406. [b] Contr. to Conch., 1850, pp. 72–73.

The type is No. 58111 of the collection of the Philadelphia Academy of Natural Sciences and was collected by Garrett, in the Viti Islands.

TURBONILLA (CHEMNITZIA) CRENULATA Menke.

Plate XXI, fig. 6.

Oxytrema crenulata MENKE, Synopsis Methodica Molluscorum, 1830, p. 137.

Shell elongate-conic, subturrited, milk-white. Nuclear whorls decollated. Post-nuclear whorls flattened, somewhat shouldered at the summit, crossed by strong, rounded, very oblique, slightly sinuous, axial ribs, of which sixteen occur upon the fourth, twenty upon the tenth, and twenty-four upon the penultimate whorl. These ribs show a tendency toward fusing at the summit of the whorl, where they become slightly thickened; they extend strongly to the well-impressed sutures. Intercostal spaces about one-half as wide as the ribs, moderately depressed, terminating suddenly at the somewhat angulated periphery of the last whorl. Base of the last whorl short, well rounded, moderately large, marked only by lines of growth. Aperture subquadrate, somewhat effuse at the junction of the lip and columella, posterior angle acute, outer lip thin, showing the external sculpture within by transmitted light, columella straight, almost vertical, somewhat revolute, provided with a very weak oblique fold at its insertion; parietal wall covered by a thin callus.

There are two specimens in the Pætel collection which we believe to be the types. They are labeled "Mexico." They agree in every respect, except in the number of whorls. We have figured and described the larger one of the two, which has thirteen post-nuclear whorls and measures: long. 8.6 mm; diam. 2 mm.

Menke[a] states that the specimens were collected by Doctor Schiede. Upon search it was ascertained that Doctor Schiede collected on the

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[a] Synopsis Methodica Molluscorum, 1830, p. 137.

Atlantic side, especially about Vera Cruz. It is, therefore, quite likely that this may be the home of the present species.

Oxytrema was proposed by Rafinesque for a genus of *Melanians*.

NISITURRIS, new subgenus.

Plate XXIV, fig. 3.

This subgenus is proposed for *Turbonilla* (*N.*) *crystallina*, which is differentiated from all the Turbonillas which we have seen by its very peculiar nucleus. The nucleus in *Turbonilla* is helicoid or planorboid; in this individual, however, it is pupoid—that is, the nuclear whorls resemble a small sinistral pupa placed obliquely on the later whorls. The post-nuclear characters are those of *Chemnitzia* s. s.

TURBONILLA (NISITURRIS) CRYSTALLINA, new species.

Plate XVII, fig. 7. Plate XXIV, fig. 3.

Chemnitzia crystallina Dunker, Cat. Mus. Godeffroy, IV, 1869, p. 78 (a nomen nudum), not *Pyramis crystallina* Brown, 1827 (=*Odostomia*) nor *Odostomia crystallina* Garrett, 1873 (=*Pyramidella* (*Iphiana*) *crystallina*), nor *Odostomia* (*Auriculina*) *crystallina* Monterosato, see Carus. Prod. Fauna Medit., p. 275, 1893; =*O. diaphana* Jeffreys.

Shell very slender and thin, elongate-conic, slightly umbilicated, almost transparent. Nuclear whorls large, very much elevated, coiled to resemble a small sinistral Pupa, smooth, situated obliquely upon the spire of the post-nuclear whorls and extending considerably beyond the lateral outline of this. Post-nuclear whorls rather high between the sutures, somewhat overhanging (this is particularly true of the earlier volutions), slightly shouldered at the summit, ornamented by strong, oblique, rounded axial ribs, which are slightly cusped at their posterior extremity, where they show a tendency toward becoming fused; fused at the periphery; twenty-two of these ribs occur upon the first (this whorl is more rounded than the rest and closer ribbed), fourteen upon the second, twelve upon the fifth, sixteen upon the tenth, and twenty upon the penultimate whorl. The intercostal spaces are twice as wide as the ribs, decidedly depressed, smooth, terminating at the fusing point of the ribs on the periphery. The summits of succeeding whorls fall somewhat anterior to the periphery of the preceding whorl and give the whorls an overhanging effect as well as a narrow smooth band between the anterior termination of the intercostal spaces and the subchanneled sutures. Periphery and base of the last whorl well rounded, the latter very short, marked only by faint lines of growth. Aperture very large, almost circular in outline, outer lip thin, transparent, showing the external sculpture within; columella thin, curved and revolute, with a slight oblique fold near its insertion; parietal wall covered by a mere film of callus.

The type belongs to the Dunker collection and comes from Upolu, one of the Samoan Islands. It has twelve post-nuclear whorls and measures: long. 4.5 mm.; diam. 1 mm. The nuclear whorls measure about 1 mm. long. This species is the type of the subgenus *Nisiturris*, which differs from *Chemnitzia* s. s. by having the peculiar nucleus of the present species.

TURBONILLA (STRIOTURBONILLA) MONOCYCLA A. Adams.

Plate XXII, fig. 8.

Turbonilla monocycla A. Adams, Ann. Mag. Nat. Hist., VI, 1860, p. 418; not *Parthenia* (=*Odostomia* (*Egila?*)) *monocycla* A. Adams.

Shell elongate-conic, slender, slightly umbilicated, milk-white. Nuclear whorls small, almost completely obliquely immersed in the first post-nuclear whorl. Post-nuclear whorls very finely, wavily, spirally striated, shouldered at the summit, flattened, with a well impressed sulcus at the periphery; marked by strong, decidedly sinuous axial ribs, of which sixteen occur upon the second, nineteen upon the fifth, and thirty upon the penultimate whorl. These ribs pass over the moderately deep peripheral sulcus and render the intersections with its edges subnodulose. The entire sulcus to the anterior edge is visible above the suture; this therefore appears very deep. Intercostal spaces not quite as wide as the ribs. Base well rounded, sculptured by the continuation of the axial ribs, which extend to the umbilicus, and the minute spiral striation. Aperture rather large, suboval, posterior angle obtuse; outer lip thin, showing the external sculpture within by transmitted light; columella slender, curved, and revolute, provided with a quite strong oblique fold at its insertion.

The specimen described belongs to the Pætel collection, and comes from Japan. It has eight post-nuclear whorls, and measures: long. 4.3 mm.; diam. 1.5 mm. Another lot from the same collection and locality contains two additional specimens, both immature.

TURBONILLA (PYRGISCULUS) CANDIDISSIMA, new name.

Plate XVII, fig. 3.

=*Dunkeria candida* A. Adams, Ann. Mag. Nat. Hist., VIII, 1861, p. 301; not *Chemnitzia candida* A. Adams, Proc. Zool. Soc., 1853; nor *Turbonilla candida* de Folin, Fonds de la Mer, I, 1871.

Shell, milk-white, elongate-conic, with strongly, slopingly shouldered whorls. Nuclear whorls small, obliquely almost completely immersed. Post-nuclear whorls inflated, summits strongly, slopingly shouldered, ornamented by strong, decidedly elevated subacute, axial ribs, of which about twelve occur upon the first, eighteen upon the fifth, and twenty-two upon the penultimate whorl. These ribs extend prominently over the shoulder to the summit. Intercostal spaces about double the width of the axial ribs, crossed by alternate raised and depressed spiral bands between the sutures, the raised bands are usually a little wider than the depressions, are spirally striated, and show here and there a tendency to bifurcation. Nine depressed areas are present upon the second, eleven upon the fifth, and the penult whorl, the posterior two of which are situated upon the shoulder and are less strongly developed than the rest. Periphery and base of the last whorl well rounded, the latter somewhat produced, and sculptured like the spaces between the sutures, by the axial ribs, which extend quite prominently to the umbilicus and ten spiral raised and depressed bands. Aperture large, oval, outer lip thin, showing five deep-seated, interrupted, spiral lirations, the posterior ones of which are stronger and more distantly spaced; columella slender, revolute, curved, provided with a quite prominent fold near the insertion; parietal wall covered by a quite strong callus.

The specimen described belongs to the Dunker collection and comes from Nagasaki, Japan. It has eight post-nuclear whorls, and measures: long. 6.7 mm.; diam. 2.2 mm. There are two other specimens with this, one of which served for the description of the nucleus, which is lost in the type. Two other lots, both from Nagasaki, Japan, contain two and three specimens, respectively.

In some individuals the ribs are somewhat thickened at the anterior end of the shoulder and give this part a crenulated appearance; the width of the raised, spiral areas is also narrower in some individuals than the depressed areas.

TURBONILLA (PYRGISCUS) MUMIA A. Adams.

Plate XVII, fig. 1.

Chrysallida mumia A. Adams, Ann. Mag. Nat. Hist., VII, 1861, p. 45; not *Chemnitzia mumia* Stopani, 1858, which is not a Pyramidellid.

Shell elongate-conic, small, white. Nuclear whorls three, moderately large, helicoid, having their axis at a right angle to the axis of the later whorls and about one-third immersed in the first of them. Post-nuclear whorls slightly rounded, almost flattened, shouldered at the summit with strong rounded axial ribs which render the summits of the whorls subcrenulate. There are fourteen of these ribs on the first, twenty on the fifth, and twenty-two on the penultimate whorl. Intercostal spaces about as wide as the ribs, crossed by a slender equal and equally spaced raised spiral threads, of which there are eight on the fourth and ten on the penultimate whorl between the sutures. Periphery of the last whorl somewhat angulated. Base attenuated, sculptured like the spaces between the sutures, by the axial ribs and ten spiral threads. Aperture rather small, outer lip (fractured) showing the external markings within, columella somewhat oblique, straight, revolute, with a fold near its insertion which would scarcely be visible in a specimen with a perfect aperture.

The specimen described and figured belongs to the Pætel collection, and comes from Japan. It has eight post-nuclear whorls, and measures: long. 3.3 mm.; diam. 1. mm.

TURBONILLA (CINGULINA) CINGULATA Dunker.

Plate XXI, fig. 1.

Turbonilla cingulata Dunker, Mal. Blätt., VI, 1860, p. 239; also Moll. Jap., p. 16, 1861, pl. VIII, fig. 13; not *Monoptygma* or *Oscilla cingulata* A. Adams.

Shell elongate-conic, slender, milk-white. Nuclear whorls three, large, helicoid, rather elevated, smooth, having their axis at a right angle to the axis of the later whorls, and about one-fourth immersed in the first of them. Post-nuclear whorls ornamented between the sutures by three strong, moderately rounded, raised spiral keels, which are separated by channels of about the same width; the first keel is at the summit of the whorl; these raised keels are marked axially by irregular lines of growth while the depressed channels are crossed by numerous more or less equally developed and equally spaced slender axial bands. A trace of the first keel anterior to the periphery may be seen above the suture in several of the last whorls. The periphery of the last whorl is marked by the anterior edge of the third channel, the next keel anterior to this is like those between the sutures, the remainder of the short base is marked by five less strongly developed keels and channels, the space about the umbilical region having faint, wavy spiral striations. Aperture moderately large, suboval, posterior angle obtuse, slightly effuse at the junction of the outer lip and columella; outer lip arcuate, columella short, slender, curved, with a small and very oblique fold near its insertion which scarcely shows in the aperture; parietal wall covered by a thin callus.

The above description was made from Dunker's type specimen, the nucleus was described from a specimen belonging to the type lot which comes from Nagasaki, Japan. The type has twelve post-nuclear whorls (is minus the nucleus), and measures: long. 7.4 mm.; diam. 2.1 mm.

The type lot contains four specimens. Another lot from Hilgendorf comes from Enosima, Japan, and one belonging to the Pætel collection is labeled simply Japan.

Dunker states that the last whorl has eight lirations. He appears to have overlooked the basal one, which is not sharply defined in the somewhat worn type.

TURBONILLA (CINGULINA) CINGULATA LATICINGULA, new subspecies.

Plate XXI, fig. 3.

Shell similar to *T.* (*C.*) *cingulata*, a little more slender, with the nuclear whorls about one-third buried; the small axial bars are a little more pronounced and only four basal keels are present, the first one anterior to the periphery being extremely wide, fully double the width of the next. The aperture also is a little more effuse at the junction of the outer lip and the columella.

The type has nine post-nuclear whorls, and measures: long. 4 mm.; diam. 1.2 mm. It belongs to the Pætel collection, and comes from Japan.

TURBONILLA (MORMULA) PHILIPPIANA Dunker.

Plate XVIII, fig. 5.

Turbonilla philippiana Dunker, Mal. Blätt., VI, 1860, p. 239; also Moll. Jap., 1861, p. 16, pl. i, fig. 12.

Shell broadly conic, vitreous to milk-white. Nucleus decollated. Post-nuclear whorls well rounded, moderately shouldered, crossed by about twenty strong, rounded axial ribs; intercostal spaces rounded, a little wider than the ribs, crossed by nine subequal and subequally spaced, moderately broad incised spiral lines which extend up on the sides of the axial ribs. At irregular intervals several axial ribs are fused and enlarged to form a varix. Periphery and base of last whorl well rounded, the latter marked by the faint continuations of the axial ribs, which scarcely extend to its middle, and twelve well incised, wavy, spiral lines which become wider and more distantly spaced toward the umbilical region. Aperture rather small, subquadrate; posterior angle obtuse; columella short, somewhat straight, twisted; columellar fold not visible in the aperture; parietal wall covered by a thin callus.

Two specimens are before us; Dunker's type, from Desima, Japan, a poor and much-worn individual and another in the U. S. National Museum, received from A. Adams, collected in Japan and labeled *Mormula rissoina* A. Adams. These two specimens appear both to be young shells and are absolutely identical. We have therefore described and figured the more perfect of the two, which we do not believe to be *M. rissoina* A. Adams. Both have seven and one-half post-nuclear whorls which in the U. S. National Museum specimen No. 126062 measure: long. 5.3 mm.; diam. 2.6 mm. Dunker's specimen (type) measures: long. 5.5 mm.; diam. 2.6 mm.

TURBONILLA (MORMULA) AULICA, new name.

Plate XXII, fig. 7.

Turbonilla varicosa Dunker, Mal. Blätt., VI, 1860, p. 339; also Moll. Jap., 1861, p. 15, pl. ii, fig. 9; =? *Chemnitzia varicosa* A. Adams, 1853, not *Parthenia* (*Mormula*) *varicosa* Forbes, Report Aeg. Inv., 1844, p. 136, nor *Turbonilla varicosa* Doderlein, 1892.

Shell elongate-conic, gently and evenly tapering; flesh-color with a brown base. Nuclear whorls decollated. Post-nuclear whorls well rounded, somewhat shouldered, crossed by strong rounded axial ribs, about sixteen of which appear on the fourth, eighteen on the eighth, and twenty-two on the penultimate whorl. At irregular intervals several of these ribs are fused and enlarged to form a varix, five of which are present on this shell. Intercostal spaces about as wide as the ribs, marked by seven moderately broad, incised, spiral lines between the sutures; the posterior one of these is at some little distance below the summit. These lines are subequally spaced and of about the same width, except the last one, which is about twice as broad as the others and marks the periphery with a series of rectangular pits. The elevated spaces between the incised lines pass over the axial ribs and render them faintly nodulose. The spaces inclosed between the first and second, fourth and fifth, and sixth and seventh spiral lines are a little more elevated than the rest and hence appear as stronger nodes on the ribs. Periphery of the last whorl angulated. Base short, moderately rounded, marked by the feeble continuation of the axial ribs, which hardly extend to the umbilical region, and eight well-incised subequally spaced, wavy, spiral lines, the raised area between the anterior one of these and the series of pits at the suture is like the raised spaces between the incised lines between the sutures; the rest appear as mere wavy raised threads. Aperture subquadrate, posterior angle obtuse, outer lip showing the external sculpture within; columella straight, twisted, without apparent fold, parietal wall covered by a thin callus. Columella brown; this color tinges the adjacent area, fading out altogether on the middle of the base.

Dunker's type, the specimen here described and figured, comes from Desima, Japan. It has fourteen postnuclear whorls and measures: long. 9.6 mm.; diam. 2.2 mm.

TURBONILLA (LANCELLA) BELLA, new species.

Plate XXII, fig. 6.

Shell elongate-conic, slender, vitreous to milk-white. Nuclear whorls three, large, helicoid, considerably elevated, smooth, having their axis almost at a right angle to the axis of the later whorls. Post-nuclear whorls quite high between the sutures, well rounded, with a mere indication of a shoulder at the summit, ornamented by moderately strong, rounded axial ribs, about eighteen of which occur upon the second, twenty on the fifth, and twenty-eight upon the penultimate whorl. Intercostal spaces about two-thirds the width of the ribs. The spiral sculpture between the sutures consists of equal and subequally spaced alternate raised and depressed areas, both of which pass over the axial ribs and lend them a subnodulose aspect; eight of these areas appear on the third, nine upon the fifth, and eleven upon the penultimate whorl. In addition to the above-described sculpture, seven irregularly distributed varices are present, which consist of several enlarged and fused axial ribs. The first one of these appears on the first post-nuclear whorl. Periphery of the last whorl angular. Base very short, almost flat, marked by faint continuations of the axial ribs and twelve wavy, spiral lirations which are separated by channels of about the same width; both lirations and channels are widest at the periphery and gradually become smaller toward the umbilical area. Aperture rather small, subquadrate, posterior angle obtuse, outer lip thin, showing the external sculpture within; columella straight, slender, and somewhat revolute; columellar fold not apparent in the aperture; parietal wall covered by a mere film of callus.

The type has nine and one-eighth post-nuclear whorls and measures: long. 7.5 mm.; diam. 2.3 mm. It belongs to the Pætel collection and comes from Japan. It was labeled *Mormula elongata* H. Adams, which was evidently intended for *Turbonilla* (*Lancea*) *elongata* Pease, as A. Adams has not described a *T. elongata*. The present species strongly recalls *T.* (*Lancea*) *peasei*, but differs from it in nuclear structure, in the number of alternating raised and depressed spiral area and in the structure of the base which in *peasei* is sculptured like the space between the sutures.

TURBONILLA (LANCELLA) PEASEI, new name.

=*Turbonilla* (*Lancea*) *elongata* PEASE, Am. Jour. Conch., III, 1868, p. 293, pl. XXIV, fig. 22. Not *Turbonilla elongata* KÖNINCK, 1841; nor *Chemnitzia elongata* PHILIPPI, 1844; nor *Chemnitzia humboldtiana elongata* REQUIEN 1848. *Turbonilla* (*Lancella*) *peasei* is the type of the subgenus *Lancella.*

BABELLA, new subgenus.

Shell with strong axial ribs between the sutures and three spiral keels, two of which are at the periphery, which falls in the deep sulcus between them, and one a little anterior to the middle of the base.

Type.—*Turbonilla* (*Babella*) *cælatior*, new name.

TURBONILLA (BABELLA) CÆLATIOR, new name.

Plate XVII, fig. 9.

Parthenia cælata A. ADAMS, Jour. Linn. Soc. London, VII, 1863, p. 4; not *Turbonilla cælata* GOULD, Proc. Bost. Soc. Nat. Hist., VII, 1861, p. 406; nor *Chemnitzia cælata* CARPENTER, Ann. Mag. Nat. Hist., XV, 1865, p. 400, which may be called *hypocurta.*

Shell elongate-conic, turrited, milk-white. Nuclear whorls small, three, helicoid, rather loosely coiled and elevated, having their axis at a right angle to the axis of the later whorls and about one-third immersed in the first of them. Post-nuclear whorls flattened, strongly sculptured, with axial ribs and three spiral keels. There is a strong, rounded, rather broad spiral keel on each side of the deeply sulcate periphery; the peripheral sulcus is about as wide as a keel and marks the path for the shouldered and crenulated summit of the succeeding whorls. A second deep spiral sulcus, equal in width to the peripheral one, is situated just posterior to the posterior keel, and this marks the anterior termination of the strong, rounded, backward-slanting axial ribs between the sutures. Sixteen of these ribs occur upon the second, seventeen upon the fifth, and twenty upon the penultimate whorl. Intercostal spaces almost as wide as the ribs, crossed by two strongly impressed, moderately broad spiral lines, which also pass over and somewhat constrict the axial ribs, giving them a dumbell-shaped outline; the posterior thickened portion is a little wider than the anterior one. The space between these two deeply impressed lines is crossed by about eight minute, subequally spaced spiral striations. Periphery of the last whorl deeply sulcate, crossed by numerous closely spaced axial striations, keel anterior to the periphery almost as strong as the one posterior to it; the third keel is a little anterior to the middle of the base and is rather low and broad; the space between it and the keel above is gently rounded and finely axially striated, which is also true of the space between this keel and the umbilical area. Aperture moderately large, suboval, effuse at the junction of the outer lip and columella; posterior angle obtuse, outer lip thin, irregular in outline, showing the external sculpture within; columella short, curved, stout, bearing a strong, acute, oblique fold a little anterior to its insertion; parietal wall covered by a thin callus.

There are two lots of this species in the Berlin collection, both from Japan; one, No. 1446, containing two specimens, was received from H. Adams, and it is one of these that we have here described and figured. This specimen has nine post-nuclear whorls and measures: long. 4.4 mm.; diam. 1.5 mm. The other belongs to the Pætel collection.

ODOSTOMIA (TRABECULA) TANTILLA A. Adams.

Plate XXII, fig. 3.

Pyrgulina tantilla A. Adams, Jour. Linn. Soc. London, VII, 1863, p. 5.

Shell small, slender, turrited, milk-white. Nuclear whorls small, strongly obliquely immersed in the first post-nuclear whorl, only a portion of the last volution is visible. Post-nuclear whorls strongly shouldered, moderately rounded, rather high between the sutures, and appearing somewhat constricted at this point, marked by strong, rounded, backward slanting axial ribs, which render the summits of the whorls strongly crenulate; fourteen of these ribs occur upon the second, twenty-three upon the fourth, and thirty-two upon the penultimate whorl. Intercostal spaces about twice as wide as the ribs, crossed between the sutures by five subequally spaced, raised spiral threads, the posterior one of which is a little farther from the summit than it is from its adjacent fellow; it is also a little less strongly developed than the rest. The ribs and spiral threads thus form a series of meshes or reticulations. Periphery and base of the last whorl well rounded, sculptured, like the spaces between the sutures, by the axial ribs which continue prominently to the narrow umbilicus, and six subequal and subequally spaced spiral threads, with an indication of a very weak seventh within the narrow umbilicus. Aperture moderately large, ovoid, posterior angle obtuse, outer lip strong, columella slender, decidedly curved, and somewhat revolute, with a prominent oblique fold near its insertion; parietal wall covered by a very strong callus, which gives the peristome a complete appearance.

The U. S. National Museum has two specimens from A. Adams, collected in Japan, No. 126005, the larger one of which has furnished the figure and the above description, excepting the aperture, which is imperfect in this specimen and was described from the second individual. The large one has seven post-nuclear whorls and measures: long. 2.6 mm.; diam. 0.9 mm. The Pætel collection contains one from Japan.

ODOSTOMIA (PARTHENINA) META, new species.

Plate XXIII, fig. 5.

Shell milk-white, very small, thin, turrited, with channeled sutures and obtuse apex. Nuclear whorls small, strongly obliquely immersed in the first post-nuclear whorl; only a portion of the last volution is visible. Post-nuclear whorls somewhat overhanging, rather high between the sutures, shouldered at the summit, flattened, suddenly contracted below the periphery. The summits of succeeding whorls fall considerably anterior to the periphery, which appears decidedly angular. The whorls are marked by strong axial ribs which extend undiminished over the angular periphery and base of the last whorl to the umbilical region. Sixteen of these ribs occur upon the second, twenty-two upon the fourth and the penultimate whorl. The ribs are slightly constricted just below the summit, which gives them a beaded appearance. Intercostal spaces about twice as wide as the ribs, crossed by two closely placed, raised spiral threads, the anterior one of which marks the angulation of the periphery. The junction of ribs and spiral threads is subnodulose. Base moderately long, narrowly umbilicate. Aperture suboval, posterior angle obtuse, outer lip rather thick, columella strongly curved, with a prominent oblique fold near its insertion; parietal wall covered with a heavy callus, which gives the peristome a completed aspect.

The specimen described belongs to the Pætel collection and comes from Japan. It has six post-nuclear whorls and measures: long. 2.1 mm.; diam. 0.8 mm.

ODOSTOMIA (CHRYSALLIDA) DUX, new species.

Plate XVII, fig. 4.

Shell ovate-conic, white. Nuclear whorls moderately large, obliquely deeply immersed in the first post-nuclear whorl, the peripheral portion only of the last volution projects above the edge. Post-nuclear whorls moderately rounded, strongly crenulately shouldered, marked between the sutures by four spiral keels, the posterior two of which are a little more closely spaced than the rest and twenty axial ribs which do not extend entirely across the whorl but terminate at the sulcus which separates the third from the fourth keel. Each junction of an axial rib and a spiral keel is marked by a tubercle; the tubercles of the first and second keel belonging to the same axial rib are somewhat fused, there being a less prominent constriction between them than between the second and third, the complete effect being that of an exclamation point. The fourth spiral keel is strong and rounded and decidedly elevated, a very slender extension of the axial rib reaches across the deep spiral sulcus, which like the sulci of the base is crossed by fine, subequally spaced, raised axial threads. Base moderately well rounded, attenuated, ornamented with five subequal and subequally spaced, somewhat flattened, spiral keels. Aperture rather large, suboval, effuse at the junction of the outer lip and the columella; posterior angle acute, outer lip wavy, thin, showing the external sculpture within; columella strong, curved, reenforced by the attenuated base, provided with a strong fold at its insertion; parietal wall covered by a thin callus.

The type has four post-nuclear whorls, and measures: long. 1.8 mm.; diam. 1 mm. It is from Japan and belongs to the Pætel collection.

Of the twenty-eight species described as *Chrysallida* by A. Adams, we have been able to refer only one positively to this group, namely *C. plicata.*

ODOSTOMIA (PYRGULINA) DENSECOSTATA Garrett.

Plate XVIII, fig. 4.

Shell elongate-ovate, very thin, subdiaphanous, milk-white, shining. Nuclear whorls almost completely obliquely immersed in the first post-nuclear whorl. Post-nuclear whorls rounded, rather inflated, moderately shouldered, and marked by many well-developed, regular, rounded, toward the aperture slanting axial ribs, of which twenty occur upon the second, twenty-four upon the fifth, and thirty upon the penultimate whorl. These ribs are somewhat thickened at their posterior extremity and give the summits of the whorls a beaded appearance. Intercostal spaces a little wider than the ribs, crossed by many incised spiral lines, which are about as wide as the raised spaces between them. These incised spiral lines are a little less strongly developed on the posterior portion of the whorls, where the ribs are thickened, but anterior to these thickenings they are very regular and regularly spaced. There are eighteen on the fifth and twenty-six on the penultimate whorl. Periphery and base of the last whorl well rounded, the latter marked by the strong continuations of the axial ribs, which extend almost undiminished to the umbilical region. The intercostal spaces on the base are marked like those between the sutures by twenty-two incised spiral lines. Sutures well marked. Aperture moderately large, posterior angle acute, outer lip thin, showing the external sculpture within; junction of columella and outer lip well rounded; columella decidedly curved, thin, somewhat revolute, provided with a prominent oblique fold, a little anterior to its insertion. This fold joins the columella in such a manner as to give this a decidedly sigmoid curve. Parietal wall without callus.

Garrett's types embrace six specimens, all from the Viti Islands. The best developed one is here described and figured. It has eight post-nuclear whorls, and measures: long. 4 mm.; diam. 1.7 mm. The specimens belong to the Academy of Natural Sciences, Philadelphia, where they are entered as No. 58110. P. Fischer[a] considered this species synomymous with *Odostomia* (=*Pyrgulina*) *interstriata* Souverbie. In this we do not agree with him, but consider the present species distinct.

ODOSTOMIA (PYRGULINA) DENSECOSTATA UPOLUENSIS, new subspecies.

Plate XVIII, fig. 1.

Shell elongate-conic, subturrited, early whorls bluish-white, later ones milk-white. Nuclear whorls small, almost completely obliquely immersed in the first post-nuclear whorl; only half of the tilted last volution can be seen. Post-nuclear whorls slightly rounded, the posterior two-thirds between the sutures almost flattened, somewhat shouldered, marked by strong obliquely backward-slanting rounded axial ribs which are somewhat thickened and subcuspidate at the summits; fourteen of these ribs occur upon the first, eighteen upon the third, twenty-four upon the fifth and on the penultimate whorl. Intercostal spaces somewhat variable in width, one to one and one-half times as wide as the ribs, crossed by fine subequal and subequally spaced impressed spiral lines, the spaces between them being a little wider than the impressed lines; about twenty of these lines occur between the sutures on the fifth and twenty-two upon the penultimate whorl. Periphery and base of the last whorl well rounded, the latter marked like the spaces between the sutures by the strong continuation of the axial ribs, which extend undiminished to the small umbilical chink, and by twenty impressed spiral lines which here are almost as wide as the spaces between them. Aperture suboval, outer lip thin, showing the external sculpture within; columella slender, curved, and reflected, with a moderately strong, oblique fold at its insertion; parietal wall covered by a moderately thick callus which gives the peristome an almost continuous appearance.

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[a] Jour. de Conch., XXIV, 1876, p. 150.

The type and another specimen belong to the Pætel collection and come from Upolu, one of the Samoan Islands. The type has seven post-nuclear whorls and measures: long. 3.7 mm.; diam. 1.5 mm. It differs from *O.* (*P.*) *densecostata* Garrett in being more slender, having the whorls less inflated and rounded (*densecostata* has them decidedly rounded) and in having a greater number of axial ribs.

ODOSTOMIA (PYRGULINA) ALVEATA A. Adams.

Plate XXII, fig. 5.

Chrysallida alveata A. ADAMS, Ann. Mag. Nat. Hist., VII, 1861, p. 45.

Shell small, oblong, ovate, milk-white. Nuclear whorls decollated. Post-nuclear whorls rather high between the sutures, moderately rounded, strongly shouldered at the summit, which is subtabulated, crossed by strong, rounded, almost vertical axial ribs, which render the summit of the whorls crenulate. Eighteen of these ribs occur upon the third, and nineteen upon the penultimate whorl. Intercostal spaces about one-half as wide as the ribs, crossed by about twelve fine, subequally spaced, incised spiral lines. The summits of succeeding whorls fall a little anterior to the somewhat angulated periphery of the preceding whorl on the earlier volutions, and gives them a somewhat constricted appearance at the deep sutures. Periphery of the last whorl very faintly angulated. Base well rounded, somewhat pinched at the umbilical region, marked by the strong continuations of the axial ribs, and about ten spirally incised lines in the spaces between them. Aperture oval, posterior angle obtuse, outer lip thick (fractured) showing seven equally well-developed and equally spaced internal lirations; columella short, decidedly curved and revolute, with a strong oblique fold at its insertion; parietal wall covered by a thin callus.

The specimen described and figured belongs to the Pætel collection and comes from Japan. It has five post-nuclear whorls, and measures: long. 2. mm.; diam. 1.1 mm. It is badly worn, which prevents making an accurate count of the incised spiral lines; there are, however, probably twenty between the suture and the summit on the penultimate whorl and perhaps a similar number on the base. Adams in his description does not mention the internal lirations of the outer lip, but these are usually deep-seated, or appear at intervals, and may not have been apparent in the specimen originally described.

ODOSTOMIA (PYRGULINA) LECTA, new species.

Plate XXII, fig. 2.

Shell elongate-ovate, turrited, shouldered, sutures crenulated, shining, hyaline to milk-white. Nuclear whorls moderately large, deeply obliquely immersed in the first of the succeeding whorls, only the last half turn of the last volution is visible from the side. Post-nuclear whorls rather high between the sutures, somewhat flattened, the summit of the succeeding whorls falls a little anterior to the periphery of the preceding one, which gives the whorls a constricted appearance at the suture. The whorls are ornamented by strong sublamellar axial ribs, which are thickened and cuspid at the summit; fourteen of these ribs occur upon the first, sixteen upon the third, and twenty upon the penultimate whorl. Intercostal spaces broad and rounded, fully three times the width of the ribs, crossed by narrow, incised spiral lines, which are about one-fourth as wide as the space inclosed between them; twelve of these lines occur between the sutures upon the fourth and penultimate whorls. Periphery and base of the last whorl well rounded, the latter attenuated, marked like the space between the sutures by the prominent continuations of the axial ribs and ten incised strong, spiral lines. Aperture suboval (outer lip fractured), columella short, curved, reenforced by the attenuated base, provided with a strong, oblique fold near its insertion; parietal wall covered by a moderately thick callus, which extends over the umbilical area.

The specimen described has six post-nuclear whorls and measures: long. 3.4 mm.; diam. 1.5 mm. It belongs to the Pætel collection and was labeled *Chrysallida plicata* A. Adams, Japan. It is not *C. plicata* A. Adams, but may be one of the following species, of which Adams's description is not sufficiently diagnostic to make identification possible without authentic material: *Chrysallida pupula*, *consobrina*, and *casta*, all of which appear to belong to the subgenus *Pyrgulina*.

ODOSTOMIA (PYRGULINA) AMANDA Garrett.

Plate XVIII, fig. 3.

Odostomia amanda Garrett, Proc. Acad. Nat. Soc. Phila., 3d ser., III, 1873, p. 225, pl. III, fig. 47.

Shell, slender; elongate, conic, milk-white. Nuclear whorls, three; moderately large, helicoid, having their axis at a right angle to the axis of the later whorls and scarcely immersed in the first of them. Post-nuclear whorls moderately rounded, somewhat shouldered, ornamented by strong rounded vertical or slightly backward-slanting axial ribs which are thickened at the summit to form small cusps. Sixteen of these ribs occur upon the first, twenty upon the third, twenty-two upon the fifth, and twenty-six upon the penultimate whorl. Intercostal spaces, about as wide as the ribs, crossed by well-incised, equal and subequally spaced spiral lines which are about one-fourth as wide as the spaces inclosed between them. There are no spiral lines in the intercostal spaces near the summit of the whorls; the first one falls about parallel with the anterior limit of the cuspid summit of the axial ribs; nine lines occur between the sutures on the fourth, eleven on the fifth, and twelve on the penultimate whorl. Periphery of the last whorl very slightly angulated. Base well rounded, marked by strong continuations of the axial ribs, which extend to the umbilical region, and eighteen incised spiral lines in the intercostal spaces; these lines gradually become more crowded toward the umbilical region. Aperture moderately large, suboval, somewhat effuse at the junction of the outer lip and columella; posterior angle acute, outer lip thin, showing the external sculpture within; columella oblique, slightly curved, and somewhat revolute, reenforced by the somewhat attenuated basal portion of the last whorl; provided with a weak oblique fold at its insertion; parietal wall without perceptible callus.

The specimen described and figured is Garrett's type. It belongs to the Philadelphia Academy of Natural Sciences, where it is entered as No. 58109. It comes from the Viti Islands, has seven post-nuclear whorls and measures: long. 3 mm.; diam. 1.1 mm. The Pætel collection contains a specimen which was collected at Upolu, one of the Samoan Islands.

EGILINA, new subgenus.

Odostomias having strong axial ribs between the sutures which are interrupted at the periphery by a deep spiral sulcus. Intercostal spaces smooth. Base ornamented by spiral keels, the spaces between which are marked by many very slender axial threads.

Type.—*Odostomia* (*Egilina*) *mariella* A. Adams.

ODOSTOMIA (EGILINA) MARIELLA A. Adams.

Plate XXII, fig. 4.

Parthenia mariella A. ADAMS, Ann. Mag. Nat. Hist., VI. 1860, p. 415.

Shell small, umbilicated, regularly conic with obliquely truncated apex and deeply channeled sutures; milk-white. Nuclear whorls almost completely immersed in the first post-nuclear whorl; only half of the last volution projects above it. Post-nuclear whorls flattened, marked by strong, very obliquely backward-slanting axial ribs, which are thickened at the summits and constricted a little below the summit, which renders the top of each rib beaded. Anteriorly the ribs are terminated by the posterior margin of the peripheral sulcus; here the ribs expand somewhat and almost fuse, and this expansion gives them a subnodulose effect at this point. Intercostal spaces smooth, about as wide as the axial ribs, decidedly depressed in the middle that is, between the bead at the summit and the nodules at the periphery. Periphery of the last whorl deeply sulcate. Base well rounded, marked by about nine spiral lirations, the posterior one of which is decidedly wider than the rest; the depressed spaces between the lirations are marked by fine axial threads. Both the spiral lirations and the spaces between them gradually diminish in width from the periphery to the umbilical area. Aperture suboval, posterior angle acute, columella strongly oblique, somewhat revolute, reenforced by the somewhat attenuated base and provided with a fairly strong oblique fold near its insertion; parietal wall covered by a thick callus, which gives the peristome a continuous appearance. On the last whorl the first basal keel appears above the sutures, which is therefore not channeled like the sutures of the preceding whorls.

The specimen described has four post-nuclear whorls and measures: long. 1.8 mm.; diam. .8 mm. It belongs to the Pætel collection and comes from Japan. It was labeled *Parthenia pagodula* A. Adams, but is not that species.

ODOSTOMIA (MIRALDA?) JAMAICENSIS Clessin.

Plate XVII, fig. 6.

Miralda jamaicensis Clessin, Martini-Chemnitz, Conchylien Cabinet, 2d ed., Pyramid., 1900, p. 262, pl. XXXIV, fig. 6.

Shell elongate-ovate, turrited, milk-white. Nuclear whorls two, small, helicoid, obliquely half immersed in the first of the succeeding volutions. Post-nuclear whorls moderately rounded, strongly tabulately shouldered at the summit, ornamented by broad, slightly rounded spiral keels, three of which occur between the sutures on the first and second, and four upon the penultimate whorl. The posterior one of these keels is situated at the summit of the whorl and is not as wide as the others, and appears as if it might be strongly crenulated in well-preserved specimens. The second keel also shows traces of crenulations. The incised channels between the keels are about one-fourth as wide as the keels and are crossed by very fine, raised, quite closely spaced, backward-slanting axial threads. Periphery and base of the last whorl well rounded. The latter marked by a strong raised spiral keel on its middle and a lesser tumid area at the umbilical region; the space between the middle keel and the periphery appears to be without spiral sculpture. The entire base is crossed by lines of growth. Sutures very strongly channeled. Aperture large, broadly oval, somewhat produced at the junction of the columella and lip; posterior angle obtuse, outer lip rather thick; columella strong, curved, reenforced by the attenuated base and provided with a moderately strong oblique fold near its insertion.

There are two specimens in the Berlin collection, No. 28742, from Jamaica, obtained by Verkruzen; they have the aspect of Bowden bed fossils. The best preserved individual has four post-nuclear whorls and measures: long. 2.1 mm.; diam. 1.2 mm. If the specimens prove to be not crenulated, but simply spirally keeled, then it will have to be transferred to the subgenus *Odetta*. Clessin's figure of this species[a] is wretchedly poor.

ODOSTOMIA (MIRALDA) DIADEMA A. Adams.

Plate XVII, fig. 2.

Parthenia diadema A. Adams, Ann. Mag. Nat. Hist., V, 1860, p. 479.

Shell small, subovate, minutely umbilicated, with the summits of the whorls decidedly tabulated, white. Nuclear whorls two, moderately large, helicoid, about one-third immersed in the later whorls. Post-nuclear whorls moderately rounded, decidedly tabulated at the summit, ornamented by rounded, axial ribs which quickly diminish in strength as they pass from the summit of the whorls to the periphery; sixteen of these ribs occur upon the second, and twenty upon the penultimate whorl. The ribs are thickened at the anterior termination of the shoulder and render it decidedly crenulated. Intercostal spaces a little wider than the ribs. In addition to the axial ribs the whorls are marked by strong spiral cords, two of which can be seen between the sutures on the first and second and four and one-half upon the penultimate whorl; the junction of the posterior one of these two cords and the axial ribs form a series of tubercles. The anterior cord is only slightly tuberculated, the ribs extending only feebly to it. Periphery and base of the last whorl well rounded, the latter decidedly attenuated and marked by seven subequal and subequally spaced spiral keels. Aperture large, suboval, posterior angle very obtuse, outer lip thick, columella reenforced by the attenuated base, curved, provided with a conspicuous oblique fold near its insertion; parietal wall covered by a moderately thick callus.

There are two specimens of this species in the Berlin collection, collected in Japan and obtained from H. Adams. The better preserved one of the two has been described. It has five post-nuclear whorls and measures: long. 2.3 mm.; diam. 1.2 mm.

ODOSTOMIA (MIRALDA) GEMMA A. Adams.

Plate XXII, fig. 1.

Chrysallida gemma A. Adams, Ann. Mag. Nat. Hist., VIII, 1861, p. 302.

Shell small, elongate-conic, slender, slightly umbilicated, white. Nuclear whorls at least two, obliquely about half immersed in the first of the later whorls. Post-nuclear whorls flattened, with strong tabulated and crenulated summits, crossed by three strong, rounded, subequally spaced, spiral keels and rounded axial ribs between the sutures; the latter extend from the summit to and over the second keel, but not over the sulcus separating this from the third. The junctions of the axial ribs and spiral keels form strong tubercles. Sulcus between the second and third keel deep, decidedly deeper than the peripheral sulcus, both of which, as well as the sulci of the base are crossed by minute closely placed, axial raised threads. Base of the last whorl well rounded, somewhat attenuated, marked by five strong, rounded, subequal and subequally spaced spiral keels. Aperture oval, posterior angle acute, outer lip wavy, columella short, curved and slightly revolute, provided with a quite strong oblique fold near its insertion; parietal wall covered by a moderately thick callus.

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[a] Martini-Chemnitz, Conchylien Cabinet, 1900, p. 262, pl. xxxiv, fig. 6.

The specimen described and figured belongs to the Pætel collection and comes from Japan. It has six post-nuclear whorls and measures: long. 3.2 mm.; diam. .8 mm. The U. S. National Museum has a specimen, No. 185889, from H. Adams, also from Japan.

ODOSTOMIA (MIRALDA) species?

The Pætel collection contains another specimen of *Miralda* which is in every way heavier than *O.* (*M.*) *diadema* A. Adams. It is, however, so badly worn that positive identification at the present time is impossible. It has five post-nuclear whorls and measures: long. 2.2 mm.; diam. 1.4 mm. It is labeled *Miralda diadema* A. Adams, and comes from Japan, but is not that species.

ODOSTOMIA (MENESTHO) EXARATISSIMA, new name.

Plate XIX, figs. 3, 7.

= *Menestho exarata* A. Adams, Ann. Mag. Nat. Hist., VIII, 1861, p. 303, not *Parthenia exarata*, Carpenter, 1856.

Shell elongate-conic, soiled white. Nuclear whorls at least two, moderately large, helicoid, one-half obliquely immersed in the first post-nuclear volution, the periphery projecting slightly beyond the left outline of the spire. Post-nuclear whorls well rounded, very slightly shouldered, marked by faint lines of growth and well incised spiral lines, which are not all of the same strength nor are they equally spaced. Six of these appear upon the second, and seven upon the penultimate whorl between the sutures. Periphery and base of the last whorl well rounded, the latter sculptured like the space between the sutures, bearing six incised lines which are not quite as strong as those between the sutures. Aperture oval, effuse at the junction of the outer lip and the columella, posterior angle obtuse, outer lip thin, but opaque, columella short, curved, somewhat revolute, reenforced by the attenuated base, parietal wall covered by a faint callus.

There are five specimens of this species in the Berlin collection. They were obtained by Hilgendorf at Hakodate, Japan. The one above described has six post-nuclear whorls and measures: long. 4.2 mm.; diam. 1.9 mm. There is considerable diversity in the expression of the incised spirals in the several specimens; in one they are almost obsolete on the base. One individual is decidedly more obese than the rest (fig. 3). It has six post-nuclear whorls and measures: long. 4.8 mm.; diam. 2.5 mm. Another badly-worn individual from Japan was labeled *Vanesia exarata* A. Adams.

ODOSTOMIA (ODETTA) LECTISSIMA, new species.

Plate XXIII, fig. 3.

Shell elongate, ovate, milk-white. Nuclear whorls moderately large, almost buried in the first post-nuclear whorls, only the tumid periphery of the last volution and a mere speck of another turn are visible. Post-nuclear whorls inflated and strongly, slopingly shouldered, ornamented between the sutures by five spiral keels, the posterior one of which is much less developed than the rest and occupies the space at the suture on the shoulder. The other four are strong, well rounded, subequal and subequally spaced. The first one is at the shoulder, and the anterior edge of the fourth bounds the peripheral sulcus. The sulci between these spiral cords are deep, a little wider than the cords and crossed by very regular and regularly spaced, backward-slanting, raised axial threads, which, were they not interrupted by the spiral keels, would form continuous lines from the summits to the umbilical region. Base of the last whorl short, well rounded, somewhat pinched behind the columella but not perforated, sculptured like the space between the sutures, having five spiral keels. Aperture large, somewhat produced at the junction of the outer lip and the columella; posterior angle obtuse; outer lip thin, decidedly wavy in outline, showing the external sculpture within; columella straight, slender, somewhat revolute, with a weak fold near its insertion which is not apparent when the aperture is viewed squarely; parietal wall covered by a thin callus.

The type belongs to the Pætel collection and is from Japan. It has four post-nuclear whorls and measures: long. 1.7 mm.; diam. .1 mm.

ODOSTOMIA (ODETTA) FELIX, new species.

Plate XXI, fig. 2.

Shell broadly elongate-conic, turrited, subdiaphanous. Nuclear whorls small, almost completely obliquely immersed, only part of the last rounded volution is visible above the first of the later whorls. Post-nuclear whorls somewhat inflated, well rounded, moderately shouldered, marked by strong, equally developed, spiral keels which are separated by subequal, deep, rounded sulci. The latter are somewhat broader than the keels and crossed by many, very slender raised axial threads. Three keels are present upon the first and second, on the third a fourth keel appears partly at the suture, but the greater part of it is covered up by the summit of the succeeding volution. The penultimate whorl has four keels, the posterior one of which marks the summit and is a little wider than the rest and somewhat flattened. Periphery of the last whorl marked by a sulcus. Base well rounded, attenuated, ornamented like the spaces between the sutures, having six spiral keels. These keels, as well as the sulci, gradually diminish in breadth from the periphery to the umbilical region. Aperture oval, outer lip thin, showing the external sculpture within; columella rather heavy, somewhat curved, backed up by the attenuated base and provided with a strong oblique fold at its insertion; parietal wall covered by a thin callus.

The type belongs to the Pætel collection and comes from Japan. It has five and one-half post-nuclear whorls and measures: long, 2.6 mm.; diam., 1.3 mm. It was labeled *Evalea lirata* A. Adams, but is not that species. The U. S. National Museum has two specimens of *Odostomia* (*Odetta*) *lirata* A. Adams, from the author, which are much smaller, more slender, more oval, and less prominently sculptured than the present species.

ODOSTOMIA (ODETTA) CIRCINATA A. Adams.

Plate XXIII, fig. 6.

Oscilla circinata A. Adams, Proc. Zool. Soc., 1867, p. 311.

Shell elongate-oval, subdiaphanous. Nuclear whorls small, almost completely immersed in the first post-nuclear whorl, only the rounded two-thirds of the last volution are visible, and those indicate that the axis of the nuclear turns must be at a right angle to the axis of the later whorls. Post-nuclear whorls moderately well rounded, the last one somewhat inflated, shouldered, marked by strong, broadly rounded, subequal and subequally spaced spiral keels, which are separated by deep, rounded sulci, which are about as wide as the keels. The sulci are crossed by extremely fine and very closely spaced axial raised threads which pass up on the sides of the spiral keels, but do not cross their summits. The second and third whorls have three keels between the sutures. On the third the posterior keel at the summit of the whorl, which is a little wider than the other two, shows a spiral striation on its middle. This grows gradually stronger as the shell advances, until on the penultimate whorl it has divided this keel into two, the posterior one of which is a little less developed than the anterior one, which resembles the other between the sutures. The summit of the last whorl falls considerably below the periphery, showing five spiral keels between the sutures on the penultimate whorl. Periphery of the last whorl sulcate, sulcus like the rest and similarly sculptured.

Base well rounded, somewhat attenuated anteriorly, sculptured like the spaces between the sutures, having seven spiral keels; these keels diminish somewhat in size from the periphery to the umbilical area. Aperture subovate, posterior angle acute, outer lip thin, wavy, showing the external sculpture within, columella decidedly curved, reenforced anteriorly by the attenuated base, provided with a very strong, acute, oblique fold near its insertion; parietal wall covered by a thin callus.

There are two specimens of this species in the Pætel collection. The one described and figured has five post-nuclear whorls and measures: long. 2.1 mm.; diam. 1 mm. This species closely resembles *Odostomia* (*Evalea*) *lirata* A. Adams. It is, however, more compact than that species and has two more spiral keels on the base. *O.* (*E.*) *lirata* is not an *Evalea*, but belongs to the subgenus *Odetta;* the name should read *Odostomia* (*Odetta*) *lirata* A. Adams.

ODOSTOMIA (EVALEA) SITKAENSIS Clessin.

Plate XVII, fig. 8.

Odostomia sitkaensis Clessin, Mart. Chem. Conch. Cab., 2d Ed., Pyramid., 1900, p. 121, pl. xxx, fig. 1.

Shell elongate-conic, very regular in outline, yellowish white, shining. Nuclear whorls almost completely immersed in the first of the succeeding volution. Post-nuclear whorls moderately rounded, rather high between the sutures, slightly shouldered at the summits, marked by many fine lines of growth and numerous fine wavy spiral striations; the latter are more regularly developed and distributed than the lines of growth. (Our figure does not show the spiral markings.) The periphery of the last whorl marks the greatest diameter of the shell. The base, though rather long, falls off rather abruptly at the periphery, then tapers gradually to the anterior end of the columella; it is marked like the spaces between the sutures. Aperture large, oval; posterior angle acute, outer lip decidedly curved, almost patulous, thin; columella long, slender, gently curved, and somewhat reflected, provided with a moderately strong, oblique fold near its insertion. Parietal wall without callus.

The Berlin collection contains two specimens of this species—No. 26232, which were collected by F. Schmidt, at Sitka, Alaska. We have described and figured the most perfect of the two, which we consider Clessin's type. This specimen measures: long. 4 mm.; diam. 2 mm. Clessin's figure is worthless, as usual.

ODOSTOMIA (EVALEA) CULTA, new species.

Plate XXVI, fig. 9.

Shell regularly conic, umbilicated, yellowish white. Nuclear whorls apparently planorboid, very obliquely, almost completely, immersed in the first of the later whorls, only a portion of the last volution being visible. Post-nuclear whorls rather high between the sutures, slightly rounded (almost flattened), and subtabulately shouldered at the summits, marked by fine lines of growth and very many subequal, wavy, closely spaced striations. (These have not been indicated in our drawing.) The whorls are somewhat angulated at the periphery and the summit of succeeding whorls falls a little anterior to the periphery, which gives the sutures a decidedly channeled effect. Base of the last whorl large, rather prolonged, well rounded, marked by spiral striations which are equally as abundant as those between the sutures but somewhat stronger. Aperture moderately large, suboval, somewhat effuse anteriorly, posterior angle obtuse, outer lip thin (fractured), columella slender, curved, reflected partly over the moderately large umbilicus, provided with a strong, acute, oblique fold near its insertion; parietal wall covered by a thin callus.

The type was collected at Hakodate, Japan, by Hilgendorf. It has six post-nuclear whorls and measures: long. 4 mm.; diam. 1.8 mm.

This is a moderately large species characterized by its spiral striations, regular conic outline, and the constricted appearance of the whorls at the channeled sutures. It is evidently related to *Odostomia* (*Evalea*) *arcuata* A. Adams.

ODOSTOMIA (AMAURA) MARTENSI, new name.

Plate XXV, fig. 5.

Odostomia curta Clessin, Mart. Chem. Conch. Cab., 1900, p. 116, pl. xxviii, fig. 3. Not *Odostomia curtum* Deshayes, An. Sans. Vert. Paris Basin, 1864, p. 551, pl. xix, figs. 9–11.

Shell ovoid, heavy, yellowish white, nuclear whorls small, almost completely immersed in the first of the succeeding volutions. Post-nuclear whorls increasing regularly and rapidly in size, inflated, subtabulately shouldered at the summit, marked by numerous fine lines of growth and equally abundant, closely placed, wavy, spiral striations. These lines of growth and spiral markings give the surface a finely reticulated appearance when viewed under high magnification. (We have omitted this sculpture in our drawing, which should be considered as an outline sketch only.) Periphery and base of the last whorl decidedly rounded and inflated, marked like the space between the sutures. Aperture large, suboval, slightly effuse anteriorly, posterior angle acute; outer lip sharp at the edge but thick within; columella very strong, curved, reenforced by the body whorl from which the slightly reflected edge is separated only by a narrow line. A strong oblique fold, not completely visible when the aperture is viewed squarely, is located a little anterior to the insertion of the columella.

The type has five post-nuclear whorls and measures: long. 5.3 mm.; diam. 3.1 mm. Clessin gives the diam. as 1.3, evidently a transposition. He also cites the registration No. as 36336, while it should be 36335. His figure *almost* represents this species. The type comes from Killisnoo, Alaska, not Japan.

ODOSTOMIA (AMAURA) KRAUSEI Clessin.

Plate XXIII, fig. 2.

Odostomia krausei, CLESSIN, Mart. Chem. Conch. Cab., 2d ed., Pyramid., 1900, p. 115, pl. XXVIII, fig. 1.

Shell elongate-conic, thick and heavy, rough through erosion, yellowish white. Nuclear whorls decollated in the type (judging from the pit in the apex they are probably deeply, obliquely immersed). Post-nuclear whorls only moderately rounded, somewhat shouldered at the summit (surface decidedly eroded). Periphery and base of the last whorl well rounded, the latter with a minute umbilical chink. Aperture auricular, somewhat effuse anteriorly, posterior angle scarcely acute; outer lip very thick; columella thick, reflexed, with a broad, strong, oblique fold, a little anterior to its insertion; parietal wall covered by a thick callus.

The type has six post-nuclear whorls and measures: long, 9.9 mm.; diam. 5 mm. It was collected by Krause at Killisnoo, which is in Alaska and not in Japan as stated by Clessin. The registration number of his type in the Berlin Museum is also wrong; the specimen described and figured by him is 36335 and not 36336 as given in his account of the species.

The U. S. National Museum has two lots, one specimen, 159454, from Killisnoo, collected by Krause, and another, No. 159471, from Kadiak. They are both much eroded and can furnish no additional data to our text.

Clessin's figure cited above, will not enable any one to recognize this form.

ODOSTOMIA (ODOSTOMIA) DESIMANA, new name.

Plate XXV, fig. 3. Plate XXVI, fig. 2.

Odostomia lactea DUNKER, Mal. Blätt., VI, 1860, p. 234; also Moll. Jap., 1861, p. 17, pl. XI, fig. 4, not *Odostomia lactea* J. G. JEFFREYS, Ann. Mag. Nat. Hist., II, 1848, p. 348 (=*Turbonilla lactea* LINNÆUS), nor *Odostomia lactea* ANGAS, Proc. Zool. Soc., 1867, p. 112, pl. XIII.

Shell regularly elongate-conic, milk-white. Nuclear whorls small, obliquely almost completely immersed in the first of the succeeding whorls, only the periphery of the last two being visible. Post-nuclear whorls rather high between the sutures, very slightly rounded, slightly angulated at the periphery and scarcely at all shouldered, marked by scarcely perceptible lines of growth, and here and there by a faint trace of some very fine microscopic spiral lines. The summit of succeeding whorls falls somewhat anterior to the periphery of the preceding turns, which gives a slightly constricted appearance at the well-impressed suture. Periphery of the last whorl faintly angulated; base large, well rounded, narrowly umbilicated and somewhat effuse at the junction of the lip and columella, posterior angle acute, outer lip (fractured), thin, columella long, slender, almost straight, somewhat revolute, bearing a strong oblique fold near its insertion; parietal wall covered by a thin callus.

The specimen described is Dunker's type which comes from Desima, Japan. It is not quite mature, having seven and one-half post-nuclear whorls and measures: long. 5.3 mm.; diam. 2.2 mm. The Dunker collection contains an additional specimen from Nagasaki, Japan, of which we also give a figure. This is adult. It has nine post-nuclear whorls and measures: long. 6.7 mm.; diam. 2.8 mm. The chief difference between this and the young shell lies in the aperture, the outer lip in this case being rather patulous. The Pætel collection has one specimen from Nagasaki, Japan.

ODOSTOMIA (ODOSTOMIA) MAURITIANA, new species.

Plate XXVI, fig. 6.

Shell small, umbilicated, elongate-ovate conic, semitransparent, polished. Nuclear whorls two and one-half, moderately large, helicoid, elevated, about one-fifth immersed in the first of the succeeding whorls and having their axis at a right angle to them. Post-nuclear whorls flattened, angulated at the periphery and weakly shouldered at the summit; the latter falls somewhat anterior to the periphery of the preceding whorl and lends to it a somewhat constricted appearance at the well-impressed suture. The whorls are marked by extremely fine, closely placed, wavy spiral striations, which are visible only under very high magnification. Periphery of the last whorl somewhat angulated. Base very broad, gently rounded, somewhat pinched at the narrow umbilicus. Aperture elongate-ovate, somewhat prolonged at the junction of the outer lip and columella; posterior angle acute, outer lip thin, somewhat effuse, columella slender, decidedly curved, slightly revolute, provided with a prominent oblique fold at its insertion; parietal wall covered by a strong callus which lends the peritreme an almost continuous appearance.

The specimen described and figured belongs to the Pætel collection and comes from Mauritius. It has five post-nuclear whorls and measures: long. 2.1 mm.; diam. 1.1 mm.

ODOSTOMIA (ODOSTOMIA) HILGENDORFI Clessin.

Plate XXIV, fig. 5.

Odostomia hilgendorfi CLESSIN, Mart. Chem. Conch. Cab., 2d ed., Pyramid., 1900, p. 119, pl. XXVIII, fig. 5.

Shell broadly elongate-conic, very regularly tapering, subturrited, milk-white. Nuclear whorls two and one-half, small, helicoid, well rounded, moderately elevated, about one-third immersed in the first of the later whorls, having their axis almost at a right angle to them. Post-nuclear whorls rather high between the sutures, flattened, subtabulately shouldered at the summits and decidedly angulated at the periphery, marked by lines of growth and extremely fine, microscopic, closely placed, wavy, spiral striations. The shouldered summits of succeeding whorls fall quite a little anterior to the angulated periphery, giving the whorls a decidedly constricted appearance at the sutures, which appears decidedly channeled. Periphery of the last whorl decidedly angulated. Base slightly rounded, marked like the spaces between the sutures. Aperture suboval, posterior angle obtuse (outer lip fractured), thick; columella strong, curved, provided with a prominent lamellar plate at its insertion; parietal wall covered by a moderately thick callus.

The specimen described is Clessin's type and was collected by Hilgendorf at Hakodate. It has seven post-nuclear whorls and measures: long. 5 mm.; diam. 2.4 mm. There is a possibility that this may be one of A. Adams's species of *Odostomia*. The description of *Odostomia subangulata* A. Adams reads not unlike this, but absence of measurements, etc., make it impossible to be certain. Clessin's figures, as usual, fail to delineate the characters of this form. No trace of the peripheral angulations is shown.

ODOSTOMIA (ODOSTOMIA) LIMPIDA, new species.

Plate XXVI, fig. 7.

Shell slender, elongate-conic, semitranslucent, shining. Nuclear whorls moderately large, almost completely obliquely immersed in the first of the succeeding whorls; the peripheral edge only of the last volution is visible above this. Post-nuclear whorls rather high between the sutures, slightly rounded (almost flattened), faintly shouldered at the summit, apparently without axial or spiral sculpture. The whorls are feebly angulated at the periphery, and the summits of succeeding turns fall a little anterior to it, which renders the sutures well impressed. Base of the last whorl large, rounded, very narrowly umbilicated. Aperture large, subovate, somewhat produced at the junction of the outer lip and columella, posterior angle acute, outer lip thin; columella slender, decidedly curved and somewhat revolute, provided with a prominent lamellar fold at its insertion; parietal wall covered by a thin callus.

The type belongs to the Pætel collection and is from Japan. It has six post-nuclear whorls and measures: Long., 3.6 mm.; diam., 1.5 mm. It was labeled *Amathis pellucida* A. Adams. This appears to be a *nomen nudum*, as the only reference[a] to that we have been able to find gives the following statement: *Amathis pellucida* A. Adams = *Menestho pellucida* A. Adams.[b] It is very probable that the part of the manuscript relating to the species was omitted. It is not *Voluta* (= *Odostomia*) *pellucida* Dillwyn.[c]

A badly worn shell, perhaps an *Odostomia* s. s., very elongate and umbilicate, bears the name *Amathis concinna* A. Adams, and comes from Japan. *Amathis concinna* appears to be a *nomen nudum* for the reasons cited under *Odostomia* (*Odostomia*) *limpida*.

ODOSTOMIA (HEIDA) PANAMENSIS Clessin.

Plate XXVI, fig. 4.

Odostomia panamensis Clessin, Mart. Chem. Conch. Cab., 2d ed., Pyramid. 1900, p. 120; pl. xxviii, fig. 9.

Shell small, heavy, elongate-ovate, whorls increasing regularly in size, milk white, shining. Nuclear whorls small, almost completely obliquely immersed in the first of the succeeding volutions. Post-nuclear whorls moderately and evenly rounded, of porcellanous texture, without any apparent marking, separated by well marked sutures. Periphery of the last whorl full and rounded. Base inflated, well rounded. Aperture small, decidedly rissoid, almost channeled anteriorly, posterior angle acute; outer lip decidedly curved backward anteriorly, very thick within but beveled to form a sharp edge; columella extremely short, somewhat reflected and connected posteriorly with the very strong parietal callus, which is fully as thick as the edge of the outer lip and connects with it at the posterior angle of the aperture, thus forming a complete peristome. A prominent oblique fold is present on and a little anterior to the insertion of the columella.

There are two specimens of this species in the Berlin collection from Panama. We have considered the best preserved individuals, which evidently served Clessin for his description and figure as his type, and have here rediagnosed and figured it. It has six post-nuclear whorls and measures: Long., 3.1 mm.; diam., 1.5 mm.

Clessin for some unaccountable reason changed the characters of the aperture in the above-cited figure to harmonize with the typical *Odostomia* aperture. He seems to have failed entirely in recognizing the peculiarities of the present species.

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[a] Ann. Mag. Nat. Hist., VIII, 1861, p. 304.

[b] Ann. Mag. Nat. Hist., 1860.

[c] Cat. I, 1817, p. 508.

O. (*Heida*) *panamensis* Clessin represents the first member of this subgenus on the west coast of America; several additional species inhabit the southeast coast.

GEOGRAPHICAL TABLE.

AFRICA.

Turbonilla (*Strioturbonilla*) *secura*, new name.
Odostomia (*Odostomia*) *mauritiana*, new species,

AMERICA.

ATLANTIC COAST.

West Indies.

Pyramidella (*Triptychus*) *niveus* Mörch.
Odostomia (*Miralda*) *jamaicensis* Clessin.

Mexico.

Turbonilla (*Chemnitzia*) *crenulata* Menke.

PACIFIC COAST.

Alaska.

Odostomia (*Evalea*) *sitkaensis* Clessin.
Odostomia (*Amaura*) *martensi*, new name.
Odostomia (*Amaura*) *krausei* Clessin.

Mexico.

Pyramidella (*Longchæus*) *bicolor* Menke.
Pyramidella (*Pharcidella*) *hastata* A. Adams.
Pyramidella (*Pharcidella*) *moffati*, new name.

Panama.

Odostomia (*Heida*) *panamensis* Clessin.

AUSTRALIA.

Pyramidella (*Tiberia*) *pusilla jacksonensis*, new subspecies.

CHINA.

Pyramidella (*Syrnola*) *brunnea* A. Adams.

HAWAII.

Pyramidella (*Cossmannica*) *aciculata* A. Adams.

JAPAN.

Pyramidella (*Tiberia*) *pulchella* A. Adams.
Pyramidella (*Tiberia*) *japonica*, new species.
Pyramidella (*Tiberia*) *pusilla* A. Adams.
Pyramidella (*Tiberia*) *trifasciata* A. Adams.
Pyramidella (*Tiberia*) *dunkeri*, new name.
Pyramidella (*Actæopyramis*) *eximia* Lischke.
Pyramidella (*Actæopyramis*) *fulva* A. Adams.

Pyramidella (*Actæopyramis*) *casta* A. Adams.
Pyramidella (*Actæopyramis*) *lauta* A. Adams.
Pyramidella (*Actæopyramis*) *amoena* A. Adams.
Pyramidella (*Actæopyramis*) *punctigera* A. Adams.
Pyramidella (*Actæopyramis*) *digitalis*, new species.
Pyramidella (*Styloptygma*) *serotina* A. Adams.
Pyramidella (*Syrnola*) *cinnamomea* A. Adams.
Pyramidella (*Syrnola*) *brunnea* A. Adams.
Pyramidella (*Iphiana*) *lischkei*, new species.
Pyramidella (*Iphiana*) *tenuisculpta* Lischke.
Pyramidella (*Agatha*) *virgo* A. Adams.
Turbonilla (*Chemnitzia*) *abseida*, new species.
Turbonilla (*Chemnitzia*) *dunkeri* Clessin.
Turbonilla (*Chemnitzia*) *approximata*, new species.
Turbonilla (*Chemnitzia*) *multigyrata* Dunker.
Turbonilla (*Chemnitzia*) *acosmia*, new species.
Turbonilla (*Chemnitzia*) *actopora*, new species.
Turbonilla (*Chemnitzia*) *infantula*, new species.
Turbonilla (*Strioturbonilla*) *monocycla* A. Adams.
Turbonilla (*Pyrgisculus*) *candidissima*, new name.
Turbonilla (*Pyrgiscus*) *mumia* A. Adams.
Turbonilla (*Cingulina*) *cingulata* Dunker.
Turbonilla (*Cingulina*) *cingulata laticingula*, new subspecies.
Turbonilla (*Mormula*) *aulica*, new name.
Turbonilla (*Mormula*) *philippiana* Dunker.
Turbonilla (*Lancella*) *bella*, new species.
Turbonilla (*Babella*) *cœlatior*, new name.
Odostomia (*Trabecula*) *tantilla* A. Adams.
Odostomia (*Parthenina*) *meta*, new species.
Odostomia (*Chrysallida*) *dux*, new species.
Odostomia (*Pyrgulina*) *lecta*, new species.
Odostomia (*Pyrgulina*) *alveata* A. Adams.
Odostomia (*Egilina*) *mariella* A. Adams.
Odostomia (*Miralda*) *diadema* A. Adams.
Odostomia (*Miralda*) *gemma* A. Adams.
Odostomia (*Miralda*), species?
Odostomia (*Menestho*) *exaratissima*, new species.
Odostomia (*Odetta*) *circinata* A. Adams.
Odostomia (*Odetta*) *lirata* A. Adams.
Odostomia (*Odetta*) *felix*, new species.
Odostomia (*Odetta*) *lectissima*, new species.
Odostomia (*Evalea*) *culta*, new species.
Odostomia (*Odostomia*) *hilgendorfi* Clessin.
Odostomia (*Odostomia*) *limpida*, new species.
Odostomia (*Odostomia*) *desimana*, new species.
Odostomia (*Odostomia*), species?

SOUTH SEA ISLANDS.

Pyramidella (*Cossmannica*) *aciculata* A. Adams.
Turbonilla (*Nisiturris*) *crystallina*, new species.
Turbonilla (*Chemnitzia*) *garrettiana*, new name.
Odostomia (*Pyrgulina*) *amanda* Garrett.
Odostomia (*Pyrgulina*) *densecostata* Garrett.
Odostomia (*Pyrgulina*) *densecostata upoluensis*, new subspecies.

EXPLANATION OF PLATES.

The measurements cited after the name refer to the axial length of the specimen.

PLATE XVII.

FIG. 1. *Turbonilla* (*Pyrgiscus*) *mumia* A. Adams; 3.3 mm.; p. 343.
2. *Odostomia* (*Miralda*) *diadema* A. Adams; 2.3 mm.; p. 356.
3. *Turbonilla* (*Pyrgisculus*) *candidissima*, new name; 6.7 mm.; p. 342.
4. *Odostomia* (*Chrysallida*) *dux*, new species; type; 1.8 mm.; p. 350.
5. *Pyramidella* (*Styloptygma*) *serotina* A. Adams; 3 mm.; p. 334.
6. *Odostomia* (*Miralda ?*) *jamaicensis* Clessin; type; 2.1 mm.; p. 355.
7. *Turbonilla* (*Nisiturris*) *crystallina*, new species; type; 4.5 mm.; p. 341.
8. *Odostomia* (*Evalea*) *sitkaensis* Clessin; type; 4 mm.; p. 360.
9. *Turbonilla* (*Babella*) *cælatior*, new name; 4.4 mm.; p. 347.

PLATE XVIII.

FIG. 1. *Odostomia* (*Pyrgulina*) *densecostata upoluensis*, new subspecies; type; 3.7 mm.; p. 351.
2. *Pyramidella* (*Agatha*) *virgo* A. Adams; 13.7 mm.; p. 335.
3. *Odostomia* (*Pyrgulina*) *amanda* Garrett; type; 3 mm.; p. 353.
4. *Odostomia* (*Pyrgulina*) *densecostata* Garrett; type: 4 mm.; p. 350.
5. *Turbonilla* (*Mormula*) *philippiana* Dunker; 5.3 mm.; p. 345.

PLATE XIX.

FIG. 1. *Pyramidella* (*Actæopyramis*) *amœna* A. Adams; 7 mm.; p. 330.
2. *Pyramidella* (*Actæopyramis*) *punctigera* A. Adams; 5.4 mm.; p. 331.
3. *Odostomia* (*Menestho*) *exaratissima*, new name; 4.8 mm.; p. 357.
4. *Pyramidella* (*Actæopyramis*) *casta* A. Adams; 11.3 mm.; p. 329.
5. *Pyramidella* (*Actæopyramis*) *lauta* A. Adams; 7 mm.; p. 329.
6. *Pyramidella* (*Actæopyramis*) *digitalis*, new species; type; 2.2 mm.; p. 331.
7. *Odostomia* (*Menestho*) *exaratissima*, new name; 4.2 mm.; p. 357.

PLATE XX.

FIG. 1. *Turbonilla* (*Chemnitzia*) *approximata*, new species; type; 8.2 mm.; p. 337.
2. *Turbonilla* (*Chemnitzia*) *infantula*, new species; type; 2.1 mm.; p. 338.
3. *Turbonilla* (*Chemnitzia*) *dunkeri* Clessin; type; 6.2 mm.; p. 336.
4. *Turbonilla* (*Chemnitzia*) *multigyrata* Dunker; type; 11.5 mm.; p. 335.
5. *Turbonilla* (*Chemnitzia*) *acosmia*, new species; type; 8.4 mm.; p. 339.
6. *Turbonilla* (*Chemnitzia*) *actopora*, new species; type; 6.8 mm.; p. 338.

PLATE XXI.

FIG. 1. *Turbonilla* (*Cingulina*) *cingulata* Dunker; type; 7.4 mm.; p. 344.
2. *Odostomia* (*Odetta*) *felix*, new species; type; 2.6 mm.; p. 358.
3. *Turbonilla* (*Cingulina*) *cingulata laticingula*, new subspecies; type; 4 mm.; p. 344.
4. *Turbonilla* (*Chemnitzia*) *abseida*, new species; type; 8.4 mm.; p. 337.
5. *Turbonilla* (*Chemnitzia*) *garrettiana*, new name; type; 7.4 mm.; p. 339.
6. *Turbonilla* (*Chemnitzia*) *crenulata* Menke; type; 8.6 mm.; p. 340.

PLATE XXII.

FIG. 1. *Odostomia* (*Miralda*) *gemma* A. Adams; 3.2 mm.; p. 356.
2. *Odostomia* (*Pyrgulina*) *lecta*, new species; type; 3.4 mm.; p. 352.
3. *Odostomia* (*Trabecula*) *tantilla* A. Adams; 2.6 mm.; p. 348.
4. *Odostomia* (*Egilina*) *mariella* A. Adams; 1.8 mm.; p. 354.
5. *Odostomia* (*Pyrgulina*) *alveata* A. Adams; 2 mm.; p. 351.
6. *Turbonilla* (*Lancella*) *bella*, new species; type; 7.5 mm.; p. 346.
7. *Turbonilla* (*Mormula*) *aulica*, new name; type; 9.6 mm.; p. 345.
8. *Turbonilla* (*Strioturbonilla*) *monocycla* A. Adams; 4.3 mm.; p. 342.

PLATE XXIII.

FIG. 1. *Pyramidella* (*Actæopyramis*) *eximia* Lischke; cotype?; 18.1 mm.; p. 327.
2. *Odostomia* (*Amaura*) *krausei* Clessin; type; 9.9 mm.; p. 362.
3. *Odostomia* (*Odetta*) *lectissima*, new species; type; 1.7 mm.; p. 358.
4. *Pyramidella* (*Actæopyramis*) *fulva* A. Adams; 20.3 mm.; p. 328.
5. *Odostomia* (*Parthenina*) *meta*, new species; type; 2.1 mm.; p. 349.
6. *Odostomia* (*Odetta*) *circinata* A. Adams; 2.1 mm.; p. 359.

PLATE XXIV.

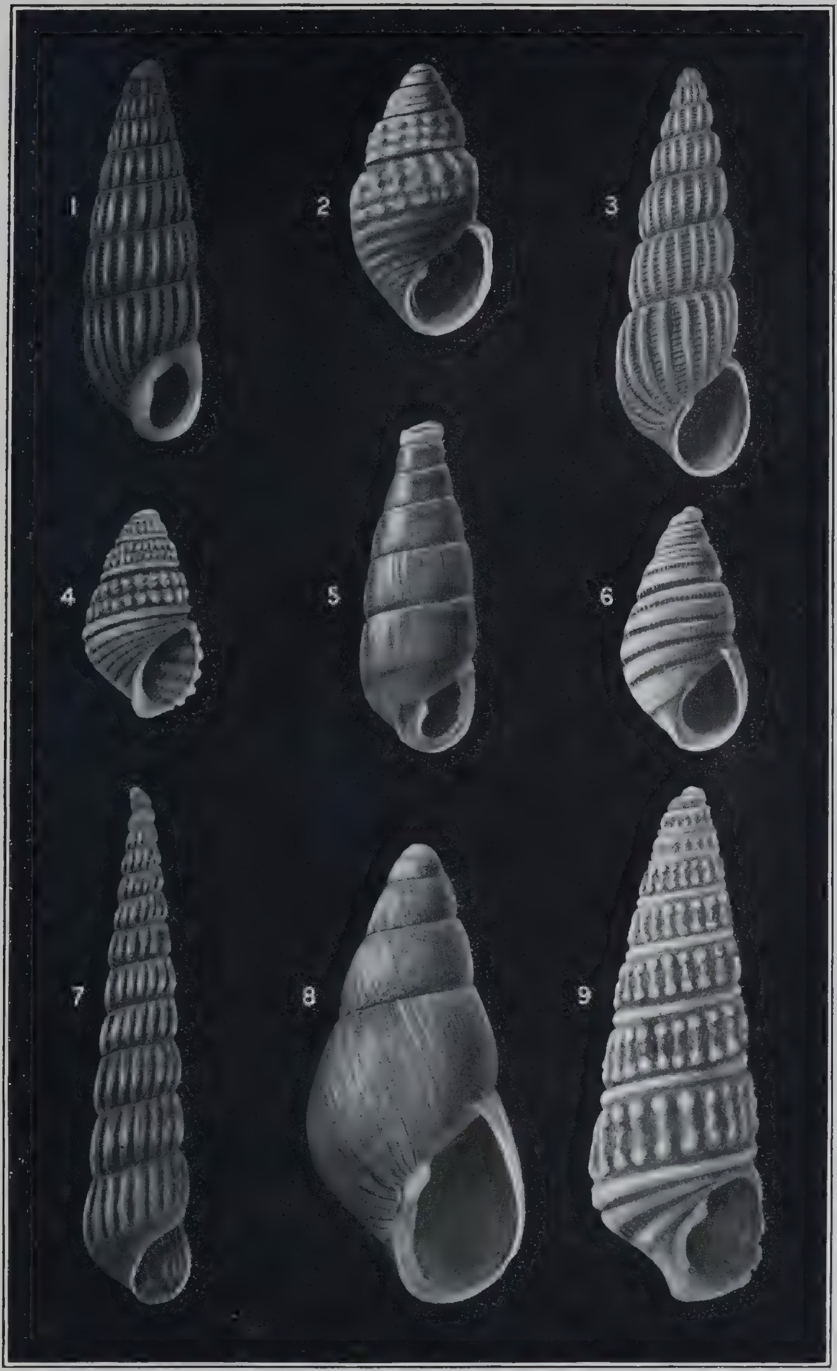
FIG. 1. *Pyramidella* (*Cossmannica*) *aciculata* A. Adams; 14.2 mm.; p. 326.
2. *Pyramidella* (*Tiberia*) *japonica*, new species; type; 6.1 mm.; p. 324.
3. *Turbonilla* (*Nisiturris*) *crystallina*, new species, nucleus much enlarged; p. 341.
4. *Pyramidella* (*Syrnola*) *brunnea* A. Adams; 17.6 mm.; p. 332.
5. *Odostomia* (*Odostomia*) *hilgendorfi* Clessin; type; 5 mm.; p. 364.
6. *Pyramidella* (*Tiberia*) *pusilla* A. Adams; 6.4 mm.; p. 324.
7. *Pyramidella* (*Syrnola*) *brunnea* A. Adams; a portion much enlarged to show spiral sculpture; p. 332.
8. *Pyramidella* (*Cossmannica*) *aciculata* A. Adams; a portion much enlarged to show spiral sculpture; p. 326.

PLATE XXV.

FIG. 1. *Pyramidella* (*Iphiana*) *lischkei*, new species; type; 4.6 mm.; p. 333.
2. *Pyramidella* (*Tiberia*) *dunkeri*, new name; type; 5 mm.; p. 326.
3. *Odostomia* (*Odostomia*) *desimana*, new name; 6.7 mm.; p. 362.
4. *Pyramidella* (*Tiberia*) *pulchella* A. Adams; 12.2 mm.; p. 323.
5. *Odostomia* (*Amaura*) *martensi*, new name; type; 5.3 mm.; p. 361.
6. *Pyramidella* (*Tiberia*) *trifasciata* A. Adams; 6 mm.; p. 325.

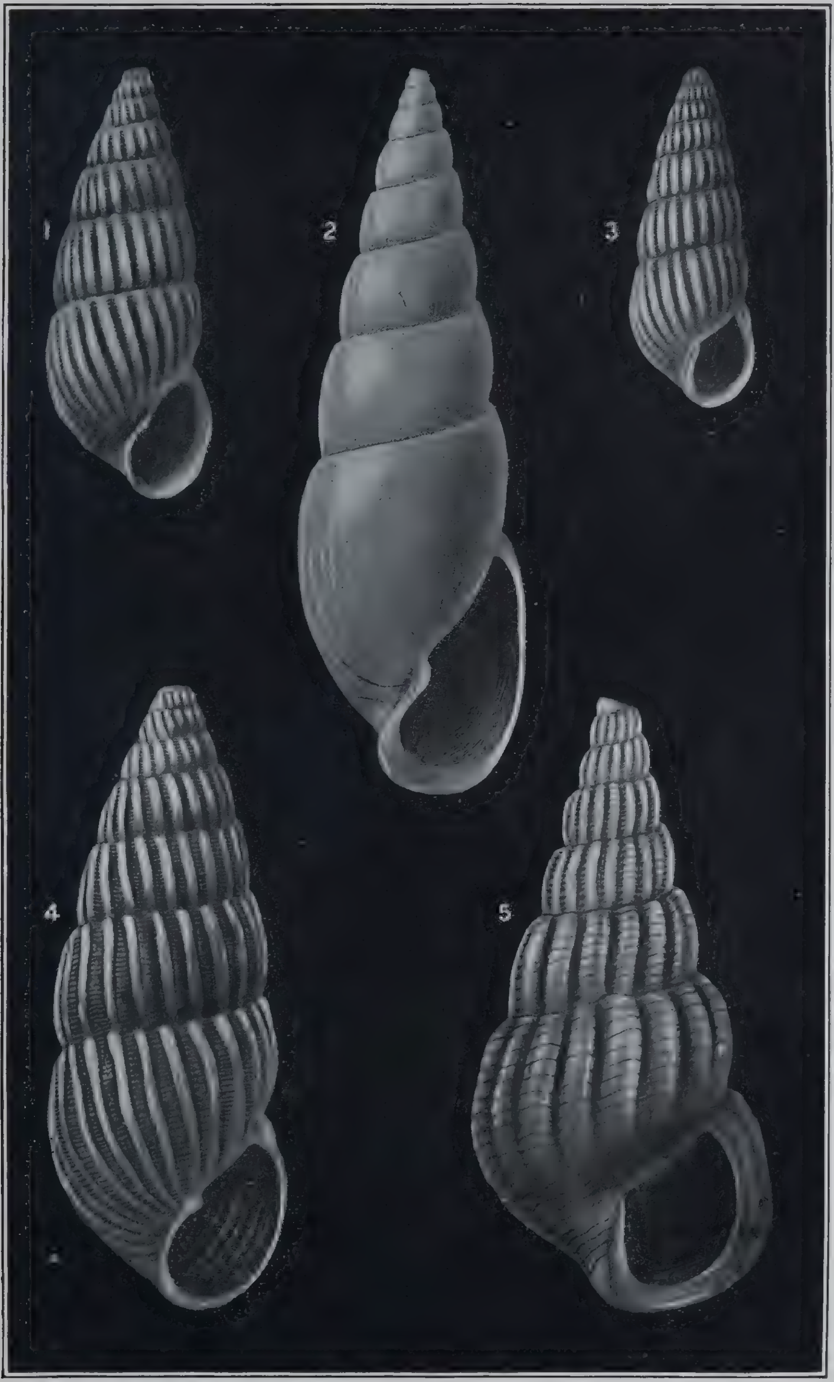
PLATE XXVI.

FIG. 1. *Pyramidella* (*Syrnola*) *cinnamomea* A. Adams; 4.2 mm.; p. 332.
2. *Odostomia* (*Odostomia*) *desimana*, new name; type; 5.3 mm.; p. 362.
3. *Pyramidella* (*Iphiana*) *tenuisculpta* Lischke; 10.4 mm.; p. 334.
4. *Odostomia* (*Heida*) *panamensis* Clessin; type; 3.1 mm.; p. 365.
5. *Pyramidella* (*Iphiana*) *tenuisculpta* Lischke; a portion much enlarged to show spiral sculpture; p. 334.
6. *Odostomia* (*Odostomia*) *mauritiana*, new species; type; 2.1 mm.; p. 363.
7. *Odostomia* (*Odostomia*) *limpida*, new species; type; 3.6 mm.; p. 364.
8. *Pyramidella* (*Tiberia*) *pusilla jacksonensis*, new subspecies; type; 6.1 mm.; p. 325.
9. *Odostomia* (*Evalea*) *culta*, new species; type; 4 mm.; p. 361.



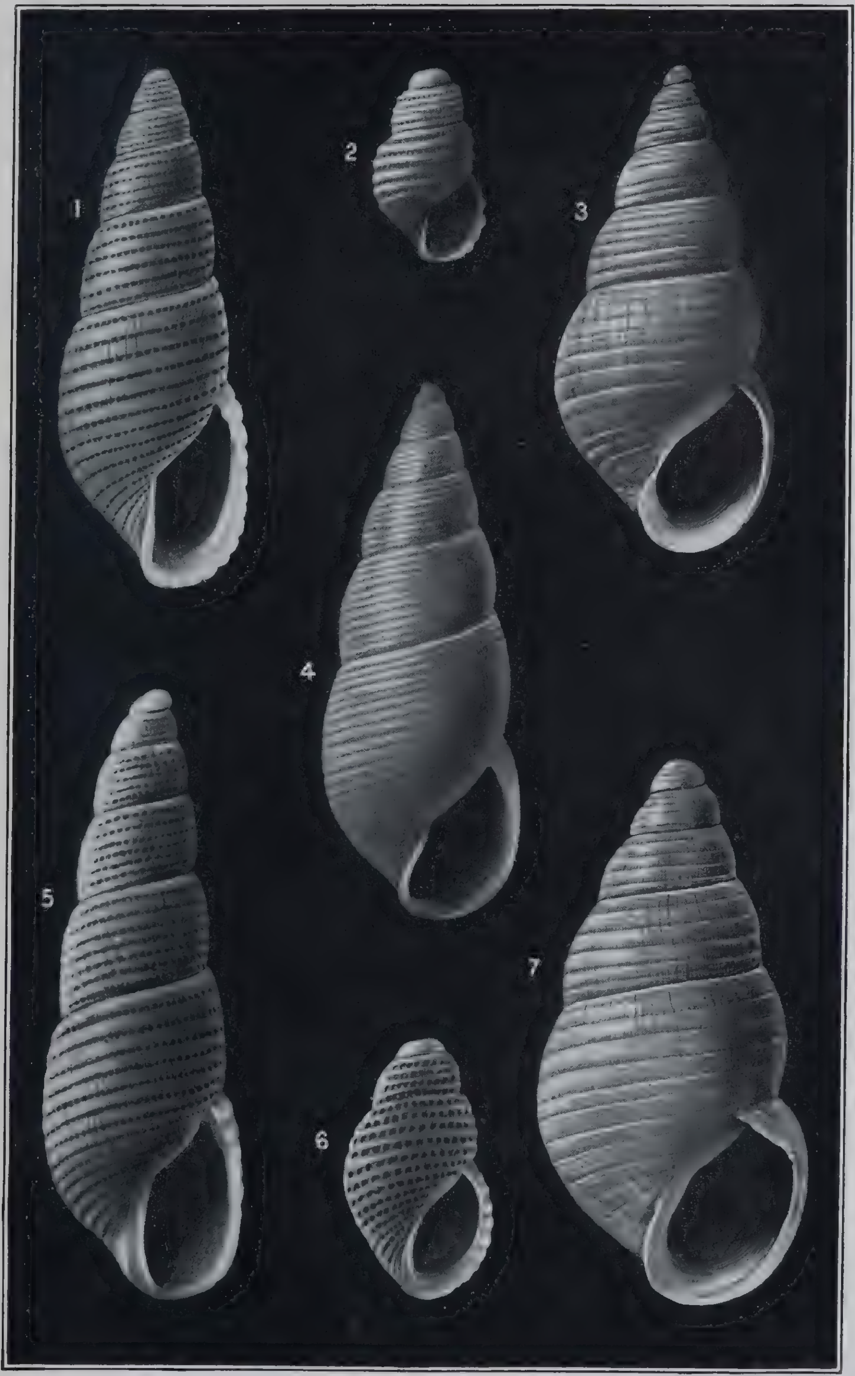
Mollusks of the Family Pyramidellidæ.

For explanation of plate see page 368.



Mollusks of the Family Pyramidellidæ.

For explanation of plate see page 368.



Mollusks of the Family Pyramidellidæ.

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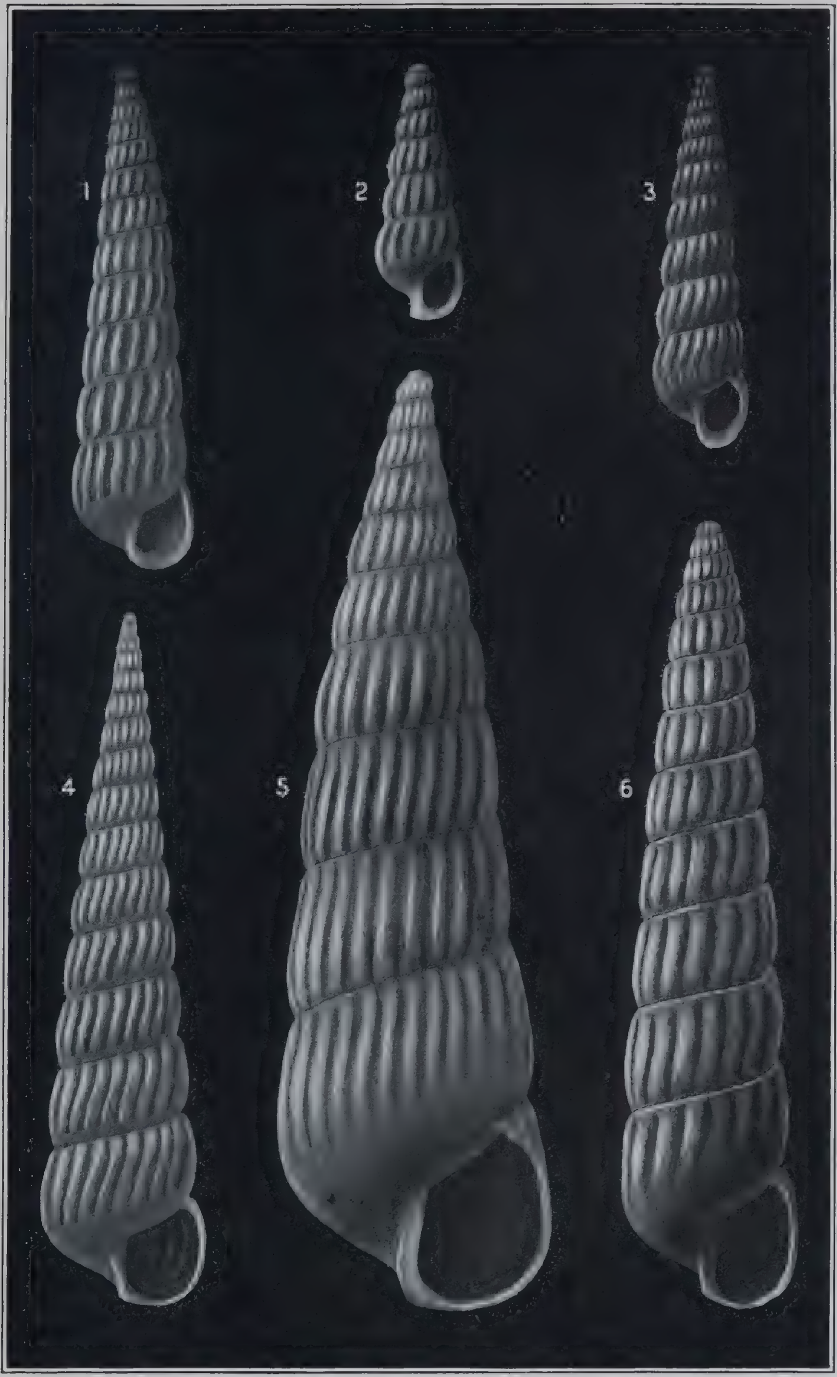
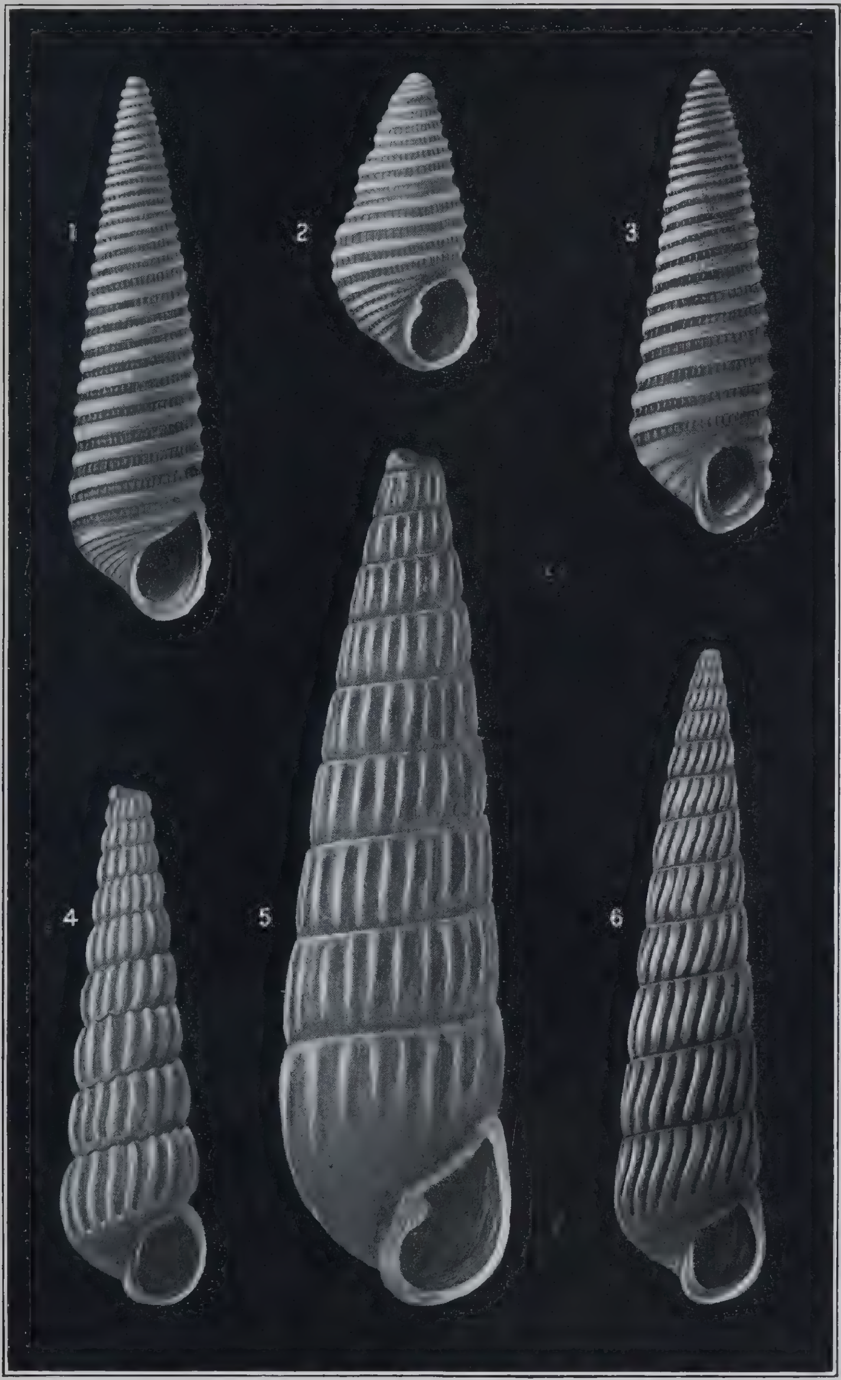


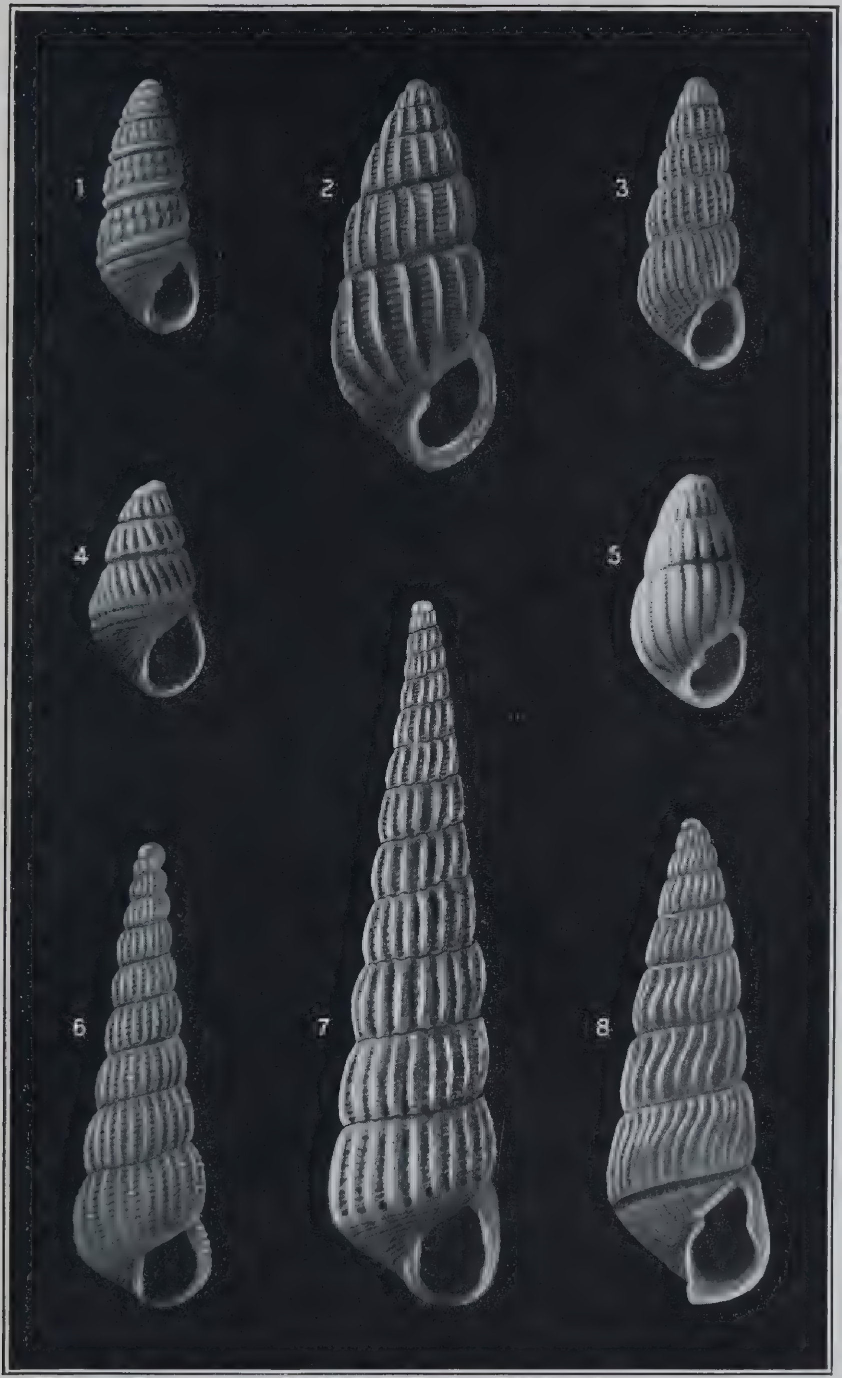
Mollusks of the Family Pyramidellidæ.

For explanation of plate see page 368.



MOLLUSKS OF THE FAMILY PYRAMIDELLIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 368.



Mollusks of the Family Pyramidellidæ.

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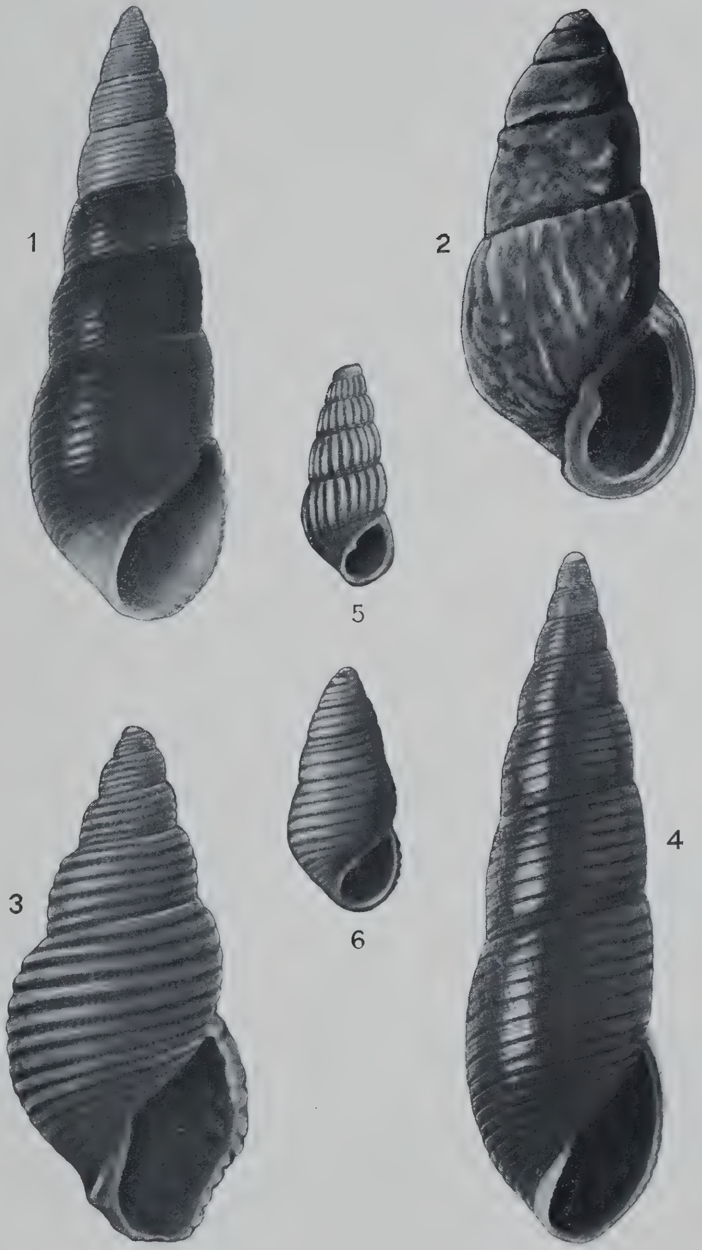
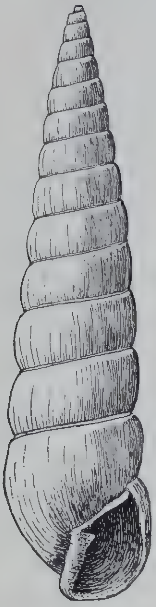


Mollusks of the Family Pyramidellidæ.

For explanation of plate see page 369.



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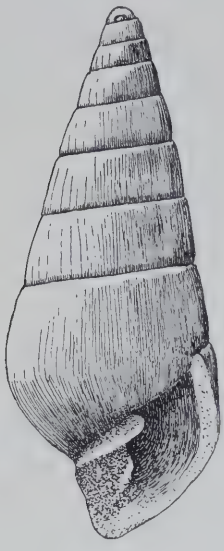

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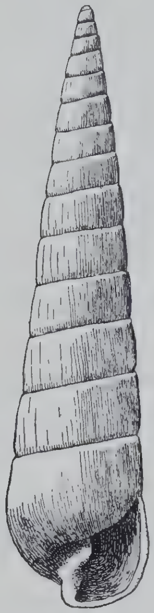

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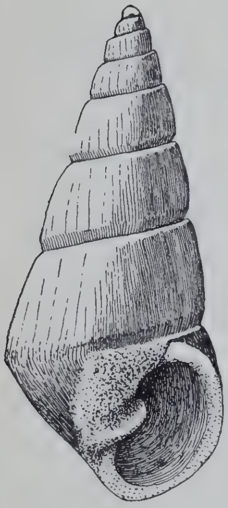

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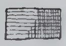

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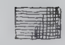

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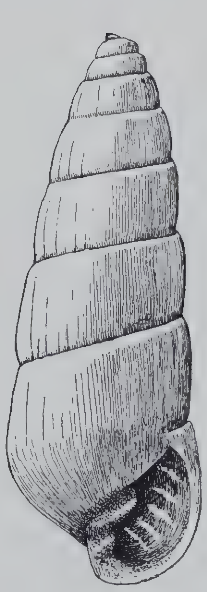

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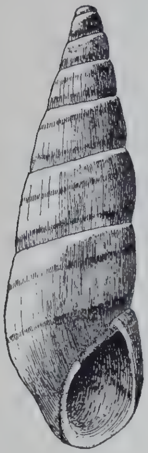
Mollusks of the Family Pyramidellidæ.

For explanation of plate see page 369.



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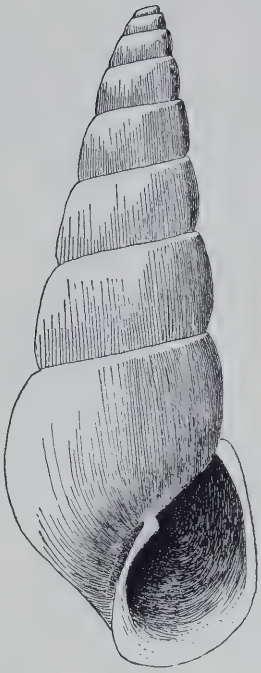

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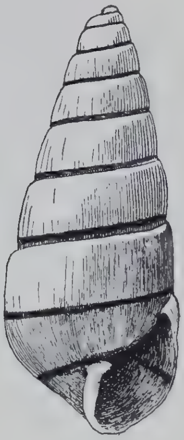

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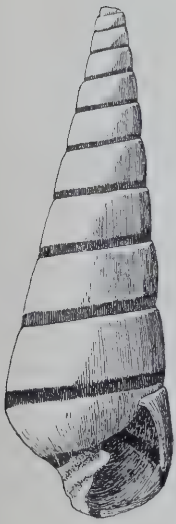

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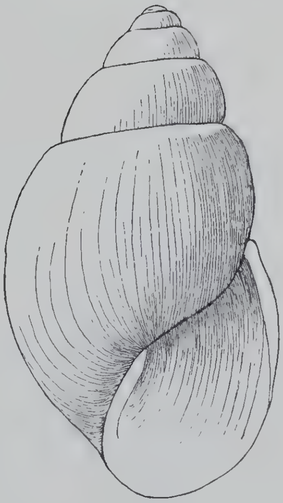

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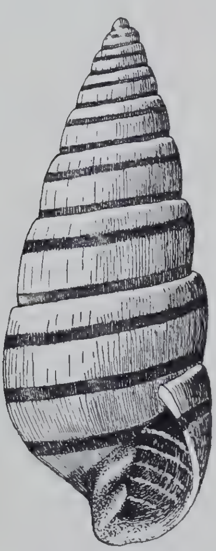

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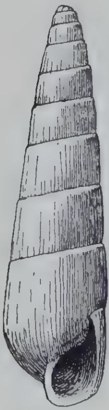
MOLLUSKS OF THE FAMILY PYRAMIDELLIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 369.



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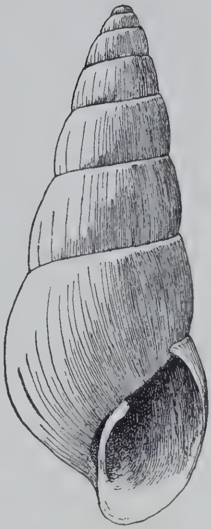

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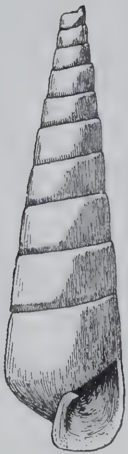

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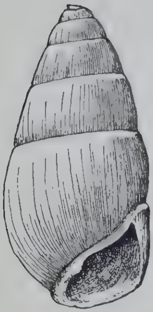

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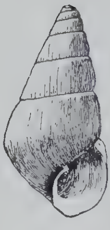

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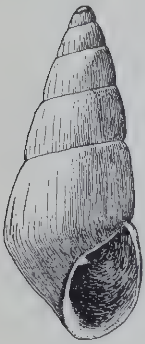

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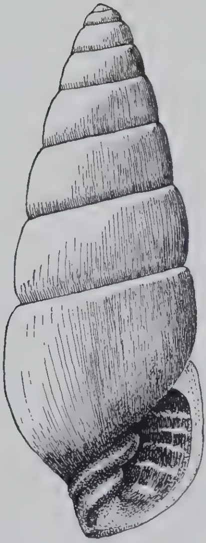

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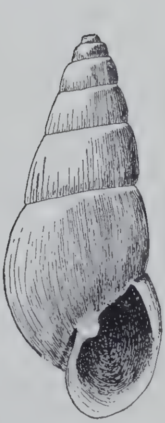

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Mollusks of the Family Pyramidellidæ.

For explanation of plate see page 369.

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THE PYRAMIDELLID MOLLUSKS OF THE OREGONIAN FAUNAL AREA.

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BY

WILLIAM HEALEY DALL and PAUL BARTSCH
Of the Division of Mollusks, U. S. National Museum

No. 1574.—From the Proceedings of the United States National Museum,
Vol. XXXIII, pages 491–534, with Plates XLIV–XLVIII

Published December 31, 1907

FOR THE INCREASE AND DIFFUSION OF KNOWLEDGE AMONG MEN · PER ORBEM · SMITHSONIAN INSTITUTION · WASHINGTON · 1846

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INTRODUCTION.

The completion of the monograph of West American Pyramidellidæ upon which the authors of the present paper have for some years been at work, being delayed by various causes—though in large part long ready for the printer—it was thought best to select from it, for immediate publication, the portion relating to the Oregonian fauna, which to a considerable extent is complete in itself, pending the completion of details relating to other faunal areas of the coast.

For the purposes of the present paper, subject to future modification with greater knowledge, the fauna here named Oregonian extends from the northern limit of the Alexander Archipelago southward along the coast to Point Conception, California. The limits of any fauna are never quite absolute, there is always a partial merging of the peripheral population with that of the adjacent faunal areas, but the proportion of Pyramidellid species in the present case, which are held in common with the faunas northwest and southeast of that here called Oregonian, is noticeably small.

Attention is called to the fact that it is a Pyramidellid fauna which is here discussed. The general molluscan fauna, still more the general invertebrate fauna of the coast in question, may or may not eventually be found to agree in distribution with our Pyramidellids. That is a question which we are not ready to decide at the present time and which will demand much more time and study than it has yet been possible to give to it.

Collections over this long stretch of coast, comprising some 22 degrees of latitude, or more than 1,300 geographical miles, have naturally been concentrated at the most accessible points, while there are long stretches of coast without harbors where as yet no collections whatever have been made. Neglecting the deep-sea dredgings, which have afforded hardly any Pyramidellids in the area under consideration, the principal localities where collections have been made are: Sitka; the region about the eastern end of Vancouver Island, including the Straits of Fuca, the Gulf of Georgia, and Puget Sound; the vicinity of San Francisco, California; and Monterey Bay.

It is well to note that in the great archipelago extending from Fuca Strait to Cross Sound there is a marked difference between the fauna of the inner channels, which have their waters chilled by the discharges from a multitude of glacial streams, and that of the outer coast, which is washed by the comparatively warmer waters of the Pacific Ocean. Many southern forms creep up along the outer coast which are unknown from the inland bays and channels.

From the paucity of information in regard to a considerable part of the coast referred to, generalizations as to distribution at present can at best be of a purely tentative character, and are therefore submitted with due reserve.

The recognition of new species and the distribution by collectors of their discoveries under the new manuscript names has been going on for several years, and it seems essential that the publication of the data should be made with as little delay as possible, in order that these names may be used in local lists and other places without leading to confusion.

The junior author has prepared the text of this paper, with the exception of this introduction, and the part of the senior author has been chiefly the collecting of material for study and an editorial supervision of details, including the text herewith. The drawings of the species were in part prepared by the late Dr. J. C. McConnell and, since his death, chiefly by Miss Evelyn Mitchell.

Genus TURBONILLA Risso.[a]

Turbonilla Risso, Hist. Nat. Eur. Mer., IV, 1826, p. 224=*Euturbonilla* Semper, Arch. Nat. Fr. Meck., 1861, pp. 354–361.

Shell with sinistral apex, cylindro-conic, many whorled, generally slender; with a single columellar fold which varies in strength and frequently is not visible in the aperture.

Type.—Turbonilla typica Dall and Bartsch.

---

[a] In the preparation of the present diagnoses the following terminology is used:

"Axial sculpture," the markings which extend from the summit of the whorls toward the umbilicus.

The axial sculpture may be—

"Vertical," when the markings are in general parallelism with the axis of the shell.

"Protractive," when the markings slant forward from the preceding suture.

"Retractive," when the markings slant backward from the suture.

"Spiral sculpture," the markings following the directions of the coils of the whorls.

The following 6 of the 23 recognized subgenera are represented in the present faunal area: *Turbonilla* s. s., *Chemnitzia*, *Strioturbonilla*, *Pyrgolampros*, *Pyrgiscus*, and *Mormula*.

KEY TO SUBGENERA OF TURBONILLA.

Shell with spiral sculpture:
Varices present.. *Mormula* p. 510.
Varices absent.
Spiral sculpture consisting of many very fine incised striations.
Aperture subquadrate.................................. *Strioturbonilla* p. 495.
Aperture oval... *Pyrgolampros* p. 498.
Spiral sculpture consisting of strong, incised spiral grooves.. *Pyrgiscus* p. 504.
Shell without spiral sculpture:
Ribs interrupted at the periphery .... *Chemnitzia* p. 494.
Ribs continuing over the base.......................... *Turbonilla* p. 493.

Subgenus TURBONILLA Risso, s. s.

Turbonilla Risso, Hist. Nat. Eur. Mer., IV, 1826, p. 224; =*Euturbonilla* Semper (part), Arch. Nat. Fr. Meck., 1861, pp. 354–361.

Turbonillas without spiral sculpture, having prominent vertical ribs which extend from the summits of the whorls to the umbilical region; the same is true of the intercostal spaces. Usually both ribs and intercostal spaces are less strongly defined on the base, below the periphery, than on the exposed portion of the whorls above it. Columella straight or slightly twisted. All our West Coast forms belonging to this subgenus are small and slender, of semitranslucent bluish-white to milk-white color.

Type.—*Turbonilla typica* Dall and Bartsch, *T. plicata* Risso, 1826, not *Turbo plicatus* Brocchi, 1814.

TURBONILLA (TURBONILLA) GILLI, new species.

Plate XLIV, fig. 5.

Shell small, rather stout, inflated, dirty white. Nuclear whorls decollated, early post-nuclear whorls well rounded, later ones flat, broader at the summit than at the suture; sculpture of about fourteen strong, almost vertical, scalariform axial ribs on the second, and sixteen quite protractive ones on the succeeding whorls; on the penultimate turn, however, they are less oblique than on those preceding it. These ribs are very strongly developed at the summit of the whorls and render the deeply channeled suture decidedly coronated. Intercostal spaces deep, of about double the width of the ribs, interrupted suddenly at the decidedly angulated (almost keeled) periphery of the last whorl beyond which they reappear. Base strongly contracted, quite short, marked by the faint continuations of the axial ribs which extend to the umbilical region. Outer lip fractured; aperture? columella very strong, somewhat curved and revolute, provided with a subobsolete oblique fold.

The type and another specimen (Cat. No. 163009, U.S.N.M.) were collected by Mr. H. Hemphill at San Diego, California. The type has eight post-nuclear whorls, and measures: Length 3.3 mm., diameter 1.1 mm.

Two other lots belonging to the University of California have been examined—one, a single specimen, comes from Station 30 off Catalina Island. The other three specimens were obtained at Station 47, San Diego, California.

TURBONILLA (TURBONILLA) GILLI DELMONTENSIS, new subspecies.

Plate XLIV, fig. 7.

Shell, similar to *T. gilli*, but much more stout and less turreted, with the ribs less strongly developed and the peripheral thickening only weakly represented. The type has lost the nuclear whorls, the eight remaining measure: Length 3.4 mm., diameter 1.2 mm.

Type.—Cat. No. 195921, U.S.N.M. It was collected by Mr. S. S. Berry in 12 fathoms off Del Monte, Monterey, California.

Subgenus CHEMNITZIA D'Orbigny.

Chemnitzia D'ORBIGNY, Hist. Nat. Iles Canaries, 1839, p. 77; =*Euturbonilla* SEMPER (part), Archiv. Nat. Fr. Meck., 1861, pp. 354–361; =*Microbeliscus* SANDBERGER, 1874.

Turbonillas without spiral sculpture, having prominent axial ribs which fuse or terminate at the periphery. The intercostal spaces are deep and sunken and terminate at or a little above the periphery, extending upward to the summits of the whorls. Base smooth, devoid of all sculpture. Columella straight. All our West American species belonging to this group are small, slender, forms of semitranslucent bluish-white to milk-white color.

Type.—*Melania campanellæ* Philippi.

KEY TO SPECIES OF CHEMNITZIA.

Shell large, length 10 mm. or more	*montereyensis.*
Shell small, length 5 mm. or less	*muricatoides.*

TURBONILLA (CHEMNITZIA?) MONTEREYENSIS, new name.

=*Turbonilla gracillima* GABB, Proc. Cala. Acad. Sci., 1865, p. 186; not *Chemnitzia gracillima* CARPENTER, Cat. Maz. Shells, 1856, p. 431.

Mr. Gabb's description is as follows:

> Shell small, very slender, long, white; vertex broken; whorls eleven or more, flattened on the sides; sutures strongly impressed, ribs about 23, large, obtuse, running from the suture to the margin of the base, base convexly truncated, smooth, aperture subcircular; columella thick. Length 10 mm., diameter 3.3 mm.
>
> Habitat, Monterey, California; Dr. J. G. Cooper collector. This shell can be readily distinguished by its extremely slender form and the strong, slightly oblique ribs,

The type, according to Mr. Gabb, is in the collection of the California Geological Survey,[a] but appears to have been misplaced or lost. From the description we are led to believe that it is a form similar to *T. torquata*, but of considerably broader spire.

TURBONILLA (CHEMNITZIA) MURICATOIDES, new species.

Plate XLIV, figs. 2, *2a*.

Shell small, slender, subdiaphanous to milk white; nuclear whorls 2½, helicoid but slightly elevated, well rounded, having their axis at right angles to the axis of the post-nuclear turn. Post-nuclear whorls smooth, rather high between the sutures, moderately rounded, marked by strong sublamellar axial ribs, which are about half as wide as the spaces that separate them, and extend strongly to the very summit of the whorl where they render the well-marked sutures crenulate. There are 14 of these ribs upon the first, 18 upon the fifth, and 20 upon the penultimate turn. The depressed intercostal spaces terminate abruptly at the periphery. Base of the last whorl well rounded, smooth, without sculpture. Aperture: (outer lip fractured), columella slender, slightly twisted.

The type has seven post-nuclear turns and measures: Length 3.0 mm., diameter 1.0 mm. It is Cat. No. 195942, U.S.N.M., and comes from Monterey, California. Another specimen, Cat. No. 160488, U.S.N.M., was collected by Doctor Dall at the same place.

Subgenus **STRIOTURBONILLA** Sacco.

Strioturbonilla Sacco, I Moll. del Piemonte e della Liguria, 1892, p. 94.

Shell as in *Turbonilla* and *Chemnitzia* but finely and closely spirally striated on the spire and base.

Type.—*S. alpina* Sacco.

All our West American species, with the exception of *T. affinis* and *T. smithsoni*, are of bluish-white to milk-white color; the two exceptions being of a yellowish cast.

KEY TO SPECIES OF STRIOTURBONILLA.

Whorls overhanging, shell stout .... *vancouverensis.*
Whorls not overhanging, shell slender
  Whorls strongly rounded, ribs sinuous .... *stylina.*
  Whorls almost flattened, ribs straight .... *serræ.*

TURBONILLA (STRIOTURBONILLA) VANCOUVERENSIS Baird.

Plate XLIV, fig. 1.

Chemnitzia vancouverensis Baird, Proc. Zool. Soc., 1863, p. 67.

Shell solid, rather broad and stout, subdiaphanous, bluish to milk-white. Nuclear whorls two, large, helicoid, partly obliquely immersed in the first of the later turns. Post-nuclear whorls well rounded, with the greatest convexity on the lower half of the exposed portion; ornamented by about 10, very broad, strong, slightly protractive axial ribs on the second, 14 on the fifth, 16 on the eighth, and 18 on the penultimate whorl. These ribs terminate before they reach the periphery of the whorl, leaving a plain band above the suture, as in *T. torquata* Gould, but not as broad as in that species. Intercostal spaces deep, narrower than the ribs. Sutures well marked by the shouldering at the summit and the sudden sloping of the ribs just above the periphery of the whorls. Aperture subovate; lip thin, joining the short, somewhat revolute columella in a gentle, even curve. Entire surface marked by faint wavy spiral striations. The specimen figured has 10 post-nuclear whorls and measures: Length 6.0 mm., diameter 1.8 mm. Another specimen from the same locality, which has 12 post-nuclear whorls, but is minus the nucleus and probably the first of the succeeding turns, measures: Length 9.2 mm., diameter 2.5 mm.

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[a] Proc. Cal. Acad. Sci., 1865, p. 183.

This species resembles *T. torquata* Gould, but can easily be distinguished from it by its broader base, its large, partly immersed, slanting nucleus, and the robust character of its whorls and ribs, the latter being fewer and much broader; the intercostal spaces being comparatively narrower. Doctor Baird's type was collected at Esquimalt Harbor, Vancouver Island, British Columbia.

Specimens examined.

2. Kadiak Island, Alaska. 13 fathoms. W. H. Dall. Cat. No. 160489, U.S.N.M.
1. Lituya Bay, Alaska. 8 fathoms. W. H. Dall. Cat. No. 160490, U.S.N.M.
1. Port Etches, Alaska. W. H. Dall. Cat. No. 160993, U.S.N.M.
4. Victoria, Vancouver Island, British Columbia. C. F. Newcombe, Cat. No. 126670, U.S.N.M.
1. Puget Sound, Washington. Doctor Kennerley. Cat. No. 44938, U.S.N.M.
1. Monterey, California. 28 fathoms. S. S. Berry. In Mr. Berry's collection.
1. Carter Bay, British Columbia. Rev. G. W. Taylor. Cat. No. 196184, U.S.N.M.
1. Carter Bay, British Columbia. Rev. G. W. Taylor. Rev. G. W. Taylor collection.
3. Port Simpson, British Columbia. Rev. G. W. Taylor. Cat. No. 196183, U.S.N.M.
11. Port Simpson, British Columbia. Rev. G. W. Taylor. Rev. G. W. Taylor collection.
2. West of Rose Spit, Queen Charlotte Island, British Columbia. Rev. G. W. Taylor. Rev. G. W. Taylor collection.
1. Alert Bay, British Columbia. Rev. G. W. Taylor. Rev. G. W. Taylor collection.
20. Departure Bay, British Columbia. Rev. G. W. Taylor. Rev. G. W. Taylor collection.
5. Departure Bay, British Columbia. Rev. G. W. Taylor. Cat. No. 196185, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) STYLINA Carpenter.

Plate XLIV, figs. 11, 11*a*.

Chemnitzia (*?torquata* var.) *stylina* CARPENTER, Ann. Mag. Nat. Hist., 3rd ser., XV, 1865, p. 396.

Turbonilla (*Strioturbonilla*) *torquata stylina* DALL and BARTSCH, Mem. Cala. Acad., III, 1903, p. 272, in part.

Shell slender, subdiaphanous to milk-white. Nuclear whorls two, smooth, depressed, helicoid, scarcely extending beyond the outline of the spire and having their axis at right angles to the axis of the succeeding turns. Post-nuclear whorls well rounded, separated by strongly constricted sutures, rather high, ornamented by rather low, broad, rounded, sinuous, oblique axial ribs, of which there are 16 upon the first, 20 upon the fifth, and 28 upon the penultimate turn. Intercostal spaces moderately depressed, about as wide as the ribs, terminating a short distance above the sutures, thus leaving a narrow smooth band between the termination of the ribs and the suture as in *T* (*Strioturbonilla*) *torquata* Gould, but not quite as wide as in that species. Periphery of the last whorl well rounded. Base rather short, well rounded. Entire surface marked by very fine wavy spiral striations. Aperture subovate, outer lip thin, columella slender, moderately long, slightly twisted, almost vertical. The specimen described and figured (Cat. No. 56429, U.S.N.M.) was collected by Doctor Dall in 8 or 10 fathoms at Monterey, California. It has 11 post-nuclear whorls and measures: Length 6.5 mm., diameter 1.7 mm. (not 8 and 1.9 mm., as erroneously stated in the last-cited reference). Another specimen was dredged in 12 fathoms off Del Monte, Monterey, by Mr. S. S. Berry (Cat. No. 165199, U.S.N.M.). Two specimens (Cat. No. 163249, U.S.N.M.), both immature, dredged by the Bureau of Fisheries steamer *Albatross* at station 2932 in 50 fathoms off Coronado Island, are provisionally referred to this form.

TURBONILLA (STRIOTURBONILLA) SERRÆ, new species.

Plate XLIV, figs. 8, 8*a*.

Shell slender, very elongate-conic, subdiaphanous to milk-white. Nuclear whorls decollated. Post-nuclear whorls very high between the sutures, moderately rounded, slightly contracted at the periphery and somewhat shouldered at the summit, rendering the sutures subchannelled. The whorls are marked by subequal and subequally spaced, rather broad, rounded, almost vertical axial ribs, which are a little wider than the intercostal spaces; the depressed portion of the latter terminating a little above the suture. In the type, which has lost the nucleus and probably the first two post-nuclear turns, there are 16 ribs on the third of the remaining whorls, 20 on the eighth, 22 upon the eleventh, and 34 upon the next, the penultimate turn. On this whorl the axial ribs are less regular and less strongly developed, showing senile degeneration. Periphery of the last whorl well rounded. Base short, well rounded, marked by slender continuations of the axial ribs which extend feebly to the insertion of the columella. Entire surface of spire and base crossed by numerous closely placed spiral striations. Aperture subquadrate, posterior angle obtuse, outer lip thin, columella rather strong, somewhat oblique, and slightly revolute, without apparent fold in the aperture. The type has 13 whorls and measures: Length 7.7 mm., diameter 1.4 mm.

The type and seven specimens were collected by Mr. S. S. Berry, in 12 fathoms off Del Monte, Monterey, California, five of these are in Mr. Berry's collection, the type and one other form Cat. No. 196198, U.S.N.M. Cat. No. 196200, U.S.N.M., contains a specimen from 40 fathoms off Pacific Grove, Monterey, California, dredged by Mr. Berry. Another specimen in Mr. Berry's collection was dredged in shelly sand at Monterey, California, at a depth of 29 fathoms.

This species is nearest related to *Strioturbonilla stylina* Carpenter, but can readily be distinguished from it by its less rounded whorls, straighter and much stronger ribs, and by having the ribs continuing over the base and scarcely any space showing between the termination of the intercostal spaces and the suture.

Subgenus PYRGOLAMPROS Sacco.

Pyrgolampros Sacco, I. Moll. del Piemonte e della Liguria, 1892, p. 85.

Turbonillas with low, broad, rounded vertical ribs which almost always disappear as they pass over the periphery and base of the last whorl, and many very fine, faint, wavy spiral striations; surface covered by a thin epidermis. Columella usually somewhat flexuose.

Type.—P. mioperplicatulus Sacco.

All our west American species are of a light-yellow to chocolate-brown color. The intercostal spaces are not depressed as in *Chemnitzia*, but appear as simple shallow undulations between the axial ribs. The spiral striations, in perfect specimens, appear as if they were situated beneath the light-colored epidermis and were shining through it.

KEY TO SPECIES OF PYRGOLAMPROS.

Vertical ribs present
- Shell large, adult more than 10 mm. long (dark brown) .... *taylori.*
- Shell less than 10 mm. long when adult.
  - Shell very slender, brown banded.
    - Space between the sutures dark brown with two light brown bands. *berryi.*
    - Space between the sutures white on the posterior half and brown on the anterior half .... *lyalli.*

Shell rather stout, yellow.
  Whorls concave between the sutures........................*victoriana.*
  Whorls not concave between the sutures.
    Shell stout and stubby........................*valdezi.*
    Shell broadly conic.
      Uniformly golden-yellow........................*aurantia.*
      Anterior half between the sutures yellow, posterior half white. *newcombei.*
Vertical ribs obsolete........................*oregonensis.*

TURBONILLA (PYRGOLAMPROS) TAYLORI, new species.

Plate XLIV, figs. 9, 9*a*.

Shell very regularly elongate-conic, purplish-brown. Entire surface marked by numerous closely placed minute spiral striations. Nuclear whorls small, depressed helicoid, smooth, scarcely at all immersed, having their axis at a right angle to that of the later turns, the sides not projecting beyond the outline of the spire. Post-nuclear whorls quite high between the sutures, only slightly contracted toward the periphery and very weakly beveled at the appressed summits, marked by low, broad, retractive axial ribs, which are much more numerous and less strongly defined on the early whorls than on those succeeding. There are about 36 on the second, 30 upon the third, 24 upon the fourth, and 26 upon the antepenultimate post-nuclear turn. On the last whorl they become irregular and irregularly spaced, showing senility. The ribs become flattened and less strongly defined toward the summit and the periphery, disappearing at the well-rounded periphery. Sutures well marked. Base short, inflated, rounded. Aperture suboval, somewhat effuse anteriorly; posterior angle acute; outer lip thin, white edged, chestnut brown within except at the very base, which is white; columella slender, twisted, and slightly revolute anteriorly.

The above description is based upon two cotypes (Cat. No. 196210, U.S.N.M.): one, an immature specimen having the nucleus and 9 post-nuclear whorls measures: length 6.5 mm., diameter 1.9 mm., the other an adult individual having 10 whorls (is minus the nucleus and probably the first five post-nuclear turns) and measures: length 11.5 mm., diameter 3.1 mm.

The two cotypes and 30 specimens were collected by the Rev. G. W. Taylor at Departure Bay, British Columbia. The cotype and five specimens are in the U. S. National Museum (Cat. No. 196210). The rest are in the Taylor collection.

This species was collected at five additional stations in British Columbia by the Rev. Doctor Taylor, all the specimens being in his collection except where otherwise stated. One specimen at Carter Bay; 3 at Port Simpson, 1 of which is Cat. No. 196211, U.S.N.M.; 11 at Banks Island, 3 of which are Cat. No. 196212, U.S.N.M.; 6 at Alert Bay, 2 of which are Cat. No. 196213, U.S.N.M.

TURBONILLA (PYRGOLAMPROS) BERRYI, new species.

Plate XLIV, figs. 10, 10*a*.

Shell slender, very regularly acutely conic, bright-chestnut brown, with two narrow spiral bands of a lighter shade; one, the narrower of the two, is at the periphery, the other has its posterior edge at about the middle of the exposed portion between the sutures. Nuclear turns 2¼, smooth, depressed, helicoid, not immersed, having their axis at a right angle to the axis of the later whorls, their sides projecting slightly beyond the outlines of the spire. Postnuclear whorls very high between the sutures, slightly beveled at the summit and moderately constricted at the periphery, ornamented by well-developed, acute, retractive axial ribs, of which there are about 20 upon the second, 24 upon the fifth, and 26 upon the penultimate turn. These ribs extend quite strongly to the summit, where they feebly crenulate the well-impressed sutures. Periphery and base of the last whorl well rounded, marked by the continuations of the axial ribs, which gradually disappear as they cross the base. Entire surface marked by numerous very fine, closely spaced, wavy, spiral striation. Aperture suboval, somewhat effuse anteriorly; posterior angle acute; columella oblique, very slightly twisted and weakly revolute at its outer extremity.

The type (Cat. No. 196223, U.S.N.M.) has 9 post-nuclear whorls and measures: Length 8 mm., diameter 2.2 mm. It and another specimen in Mr. S. S. Berry's collection were dredged by him in 39 fathoms on sandy bottom in Monterey Bay.

Another specimen (Cat. No. 196225, U.S.N.M.) was dredged by the Bureau of Fisheries steamer *Albatross*, at Station 4564, in 9 to 10 fathoms, rocky bottom, with a temperature of 59°, 2 miles off Santa Cruz Light, Monterey Bay, California.

A fourth shell (Cat. No. 196224, U.S.N.M.) was dredged in 52 fathoms, off Catalina Island, California.

TURBONILLA (PYRGOLAMPROS) LYALLI, new species.

Plate XLIV, figs. 4, 4*a*.

Shell small and slender with strong sculpture, whitish with a broad chestnut band which extends almost halfway over the exposed portion of the whorls above the periphery and an equal distance anteriorly over the base below the periphery. Nuclear whorls two, closely appressed to each other, forming a polished depressed helicoid spire, which does not extend beyond the outline of the post-nuclear spire, is not at all immersed and has its axis at right angles to the axis of the succeeding turns. Post-nuclear whorls decidedly flattened, moderately contracted at the periphery, and slightly shouldered at the summit, ornamented by strongly elevated, moderately broad, rounded retractive axial ribs, which become somewhat flattened toward the summit and periphery of the turns. There are about 22 ribs upon the second, 20 upon the fifth and the penultimate turn. Upon the first they are very weakly expressed. Intercostal spaces broad, almost double the width of the ribs. Sutures strongly impressed. Periphery and base of the last whorl well rounded, marked by the continuations of the axial ribs which extend feebly to the umbilical region. Entire surface marked by numerous closely placed spiral striations. Aperture pyriform, posterior angle acute, columella almost straight, obliquely inserted, slightly revolute.

The unique type (Cat. No. 196221, U.S.N.M.) was collected by Rev. G. W. Taylor at Banks Island, British Columbia. It has 9 postnuclear turns and measures: Length 5.7 mm., diameter 1.4 mm.

TURBONILLA (PYRGOLAMPROS) VICTORIANA, new species.

Plate XLIV, fig. 6.

Shell elongate-conic, wax yellow to light brown. Nuclear whorls and the early succeeding turns eroded in all the specimens examined. Post-nuclear whorls quite high between the sutures, somewhat concave in the posterior two-thirds of the exposed portion, only slightly contracted toward the periphery and faintly shouldered at the summit; ornamented by low, rounded, somewhat sinuous axial ribs, which are about as wide as the shallow intercostal spaces. Sutures well marked. Periphery and base of the last whorl somewhat inflated, marked by weak continuations of the axial ribs which extend feebly to the umbilical region. Entire surface crossed by numerous, wavy spiral striations. Aperture rather elongate, oval, outer lip thin; columella moderately long, decidedly twisted and somewhat revolute in its free anterior portion; the twist at its insertion appearing as a fold.

The type (Cat. No. 126660*a*, U.S.N.M.) was collected by Dr. C. F. Newcombe at Victoria, Vancouver Island, British Columbia. It has the last seven and a half whorls and measures: Length 7 mm., diameter 2.1 mm. Ten additional specimens were collected by Rev. G. W. Taylor, at Departure Bay, Vancouver Island, British Columbia, 4 of which form Cat. No. 196220, U.S.N.M.

This species appears nearest related to *Turbonilla* (*Pyrgolampros*) *newcombei* Dall and Bartsch, but is readily distinguished from that form by its concave whorls.

TURBONILLA (PYRGOLAMPROS) VALDEZI, new species.

Plate XLIV, figs. 3, 3*a*.

=*Turbonilla* (*Pyrgolampros*) *gibbosa* Dall and Bartsch, Mem. Cala. Acad. Sci., III, 1903, pp. 27–9, pl. i, figs. 2, 2*a*, not *Chemnitzia gibbosa* Carpenter, Cat. Maz. Shells, 1857, p. 430, No. 525.

Shell inflated, robust, broad and stumpy, of light, fulvous coloration. Nuclear whorls decollated in the type. Post-nuclear whorls flattened, somewhat contracted at the periphery and rounded at the summit, traversed by broad, coarse, irregularly slanting axial ribs, which extend over the inflated periphery of the last whorl to the umbilical region, appearing less prominent on the base. About 16 of these ribs occur upon the second, 18 upon the fifth, and 24 upon the penultimate post-nuclear whorl. Entire surface of the shell crossed by very minute, close spiral striation. Suture subchanneled and wavy. Aperture ovate, outer lip thin, joining the twisted and revolute columella in a broad curve.

The type (Cat. No. 32273, U.S.N.M.) was collected at Monterey, California. It has 7 post-nuclear whorls and measures: Length 5.6 mm., diameter 2.1 mm.

Another specimen, not quite adult (Cat. No. 176624, U.S.N.M.), comes from Pacific Grove, California. This has the nuclear whorls preserved, which are two, depressed helicoid, smooth, obliquely about one-fourth immersed in the first of the succeeding turns, and having their axis at right angles to that of the later whorls. The left side of its nucleus projects slightly beyond the outline of the spire.

The present form is in every way much more robust than *T.* (*P.*) *gibbosa* Carpenter, which was described from Mazatlan, Mexico.

TURBONILLA (PYRGOLAMPROS) AURANTIA Carpenter.

Plate XLV, fig. 5.

Chemnitzia (? var.) *aurantia* Carpenter, Journ. de Conch., XII, 1865 (3d ser., V.), p. 147.

Shell similar to *T.* (*P.*) *chocolata* Carpenter, but much broader, with the close spiral striation a little more pronounced than in that species, covered by a golden-yellow epidermis. Nuclear whorls decollated in all our specimens. Post-nuclear whorls moderately rounded, but little contracted at base and but very slightly shouldered at the summit, ornamented by about 22 moderately developed, slightly retractive axial ribs on each of the whorls. These ribs become quite obsolete as they pass over the well-rounded periphery and base of the last whorl. Intercostal spaces weak, much narrower than the ribs. Sutures quite prominent, simple. Aperture large, broadly ovate, posterior angle obtuse, somewhat effuse at base; outer lip thin, columella slender, quite oblique, twisted, and revolute.

Doctor Carpenter's type (Cat. No. 4493*b*, U.S.N.M.), upon which the description is based, has 6 post-nuclear whorls and measures: Length 5.8 mm.; diameter 2.4 mm. It bears the two localities Puget Sound and Santa Barbara, and probably comes from Puget Sound.

Three other specimens (Cat. No. 126660, U.S.N.M.) were collected by Dr. C. F. Newcombe at Victoria, Vancouver Island, British Columbia, and five more by the Rev. G. W. Taylor at Departure Bay, British Columbia, one of which is Cat. No. 196205, U.S.N.M., the others being in the Taylor collection. This one has 9 whorls remaining and measures: Length 9.5 mm.; diameter 2.8 mm.

TURBONILLA (PYRGOLAMPROS) NEWCOMBEI, new species.

Plate XLV, fig. 6.

Shell regularly, broadly conic, white on the posterior half and light brown on the anterior half of the exposed portion of the whorl; base white. Nuclear whorls decollated in all the specimens seen. Post-nuclear whorls somewhat overhanging, decidedly contracted toward the periphery from the anterior fifth of the exposed part; almost flattened posterior to this, and closely appressed at the summit, separated by strongly marked sutures. Ribs about 18 upon all the turns, almost vertical, moderately elevated, rounded in the middle, decidedly flattened and widened at the summit, disappearing at the periphery. Intercostal spaces not depressed below the general surface, a little wider than the ribs. Periphery and the moderately long base well rounded, smooth, excepting the fine spiral striation which covers the entire surface of the shell. Aperture subquadrate, posterior angle acute; outer lip thin, showing the color bands within; columella slender, oblique and slightly revolute.

The type (Cat. No. 126660, U.S.N.M.) was collected by Dr. C. F. Newcombe, at Victoria, Vancouver Island, British Columbia. It has 7 post-nuclear whorls which measure: Length 5.4 mm., diameter 2.1 mm. Eighteen additional specimens were collected by Rev. G. W. Taylor at Port Simpson, British Columbia, 12 of which are in his collection, the other 6 form Cat. No. 196214, U.S.N.M.

TURBONILLA (PYRGOLAMPROS) OREGONENSIS, new species.

Plate XLV, fig. 2.

Shell elongate-conic, wax-yellow, with two yellowish-brown spiral bands, the posterior one of which encircles the turns a little above the periphery, while the anterior one, which is a little wider, is immediately posterior to it, the two being separated by a space about as wide as the posterior band. Nuclear whorls decollated in all our specimens. Post-nuclear turns very slightly rounded, moderately contracted at the periphery and closely appressed to the preceding turn at the summit. There are no well-defined ribs, the axial sculpture being reduced to mere lines of growth with here and there a weakly impressed area, probably representing an obsolete intercostal space. Sutures strongly impressed. Periphery of the last whorl faintly angulated. Base short, well rounded. Entire surface marked by fine, regular, close, spiral striation. Aperture pyriform, posterior angle acute; outer lip thin, columella somewhat twisted, scarcely revolute at its free end.

The type has 8½ whorls remaining which measure: Length 8.5 mm., diameter 2.7 mm. It and another specimen (Cat. No. 181112, U.S.N.M.) were dredged by the United States Bureau of Fisheries steamer *Albatross* at Station No. 2885 off Oregon, in 30 fathoms, with a bottom temperature of 49°.

Another specimen (Cat. No. 196222, U.S.N.M.) was dredged at Station No. 2868, off the coast of Washington, in 31 fathoms on gray sand with a bottom temperature of 46.9°.

The absence of ribs differentiates this form from all the other *Pyrgolampros* mentioned in this paper. It is allied to two species not yet described, one of which belongs to the Californian and the other to the Alaskan fauna.

Subgenus **PYRGISCUS** Philippi.

Pyrgiscus PHILIPPI, Wieg. Arch., I, 1841, p. 50.=*Pyrgostelis* MONTEROSATO, *Conch. Medit.*, 1884, p. 89.=*Ortostelis* ARADAS, Atti Dell Acad. Giov. di Catania, 1843, XX.

Turbonillas having prominent vertical ribs and deeply incised spiral lines, but no varices or internal lirations on the outer lip. Columella usually somewhat flexuous.

Type.—Melania rufa Philippi.

KEY TO SPECIES OF PYRGISCUS.

Axial ribs terminating at the periphery .... *canfieldi.*
Axial ribs passing feebly over the periphery and base of the last whorl.
  Periphery of the last whorl angulated.
    Ribs retractive .... *morchi.*
    Ribs vertical .... *antestriata.*
  Periphery of the last whorl well rounded.
    Adult shell more than 10 mm. long .... *eucosmobasis.*
    Adult shell less than 7 mm. long .... *tenuicula.*
Axial ribs extending prominently over the periphery and base of the last whorl. *castanea.*

TURBONILLA (PYRGISCUS) CANFIELDI, new species.

Plate XLVII, figs. 4, 4*a*.

Shell slender, elongate-conic, with the posterior half of the exposed portion of the whorls on the spire white and the anterior half chestnut brown, base white. Nuclear whorls 2⅔, large, smooth, forming a depressed helicoid spire whose axis is at right angles to the axis of the succeeding turn; not immersed and extending slightly beyond the outline of the spire on both sides. Post-nuclear whorls very slightly rounded, weakly roundly shouldered at the summit and very moderately contracted at the periphery, ornamented by very strong, broad, low, rounded, almost vertical axial ribs of which there are 22 upon the first, 24 upon the antepenultimate, and 28 upon the penultimate turn. These ribs extend prominently to the summit and crenulate the subchannelled sutures. Intercostal spaces narrow, not more than half the width of the ribs, crossed by 19 incised spiral lines which are of almost equal width and subequally spaced with the following exceptions, the seventh, eleventh, and the last three above the periphery are much wider, appearing as quadrangular pits in the intercostal spaces, the eleventh falling on about the middle of the exposed portion of the whorl on the spire, and the seventh about halfway between this and the summit. Periphery and base of the last whorl well rounded, the latter marked by the feeble continuations of the axial ribs which gradually disappear after crossing the periphery, and about 16 subequally spaced incised spiral lines. Aperture oval, somewhat effuse anteriorly, columella oblique, somewhat twisted with a weak oblique fold a little anterior to its insertion.

The type (Cat. No. 196229, U.S.N.M.) was dredged by Mr. S. S. Berry in 12 fathoms off Del Monte, Monterey, California. It has 10 post-nuclear whorls and measures: Length 6.3 mm., diameter 1.2 mm.

TURBONILLA (PYRGISCUS) MORCHI, new species.

Plate XLV, figs. 1, 1*a*.

Shell broadly elongate-conic, the posterior third of the exposed portion of the whorls on the spire and a narrow area about the umbilical region flesh-colored, the rest of the shell light chestnut brown. Nuclear whorls 2½, small, smooth, forming a depressed helicoid spire which has its axis at right angles to the axis of the succeeding turns and is about one-fifth immersed in the first of them. Exposed portion of the post-nuclear whorls flattened in the middle, posterior fourth sloping gently toward the summit, which is closely appressed to the preceding turn; the anterior portion slopes more abruptly, roundly toward the periphery. The whorls are ornamented by strong rather distantly spaced, moderately acute, slightly protractive axial ribs, of which 18 occur upon the first three, 16 on the next three, 18 on the seventh, and 20 upon the penultimate turn. The ribs weaken slightly and become somewhat flattened as they approach the constricted sutures. Intercostal spaces broad, almost double the width of the ribs, crossed by 7, equal and equally spaced, deeply incised spiral lines, which extend up on the sides of the ribs and feebly across them. The space between the second and third lines appears slightly nodulose on the ribs. Periphery of the last turn angulated, crossed by the continuations of the ribs, which disappear as they pass on to the short and well-rounded base. Base marked by 13 continuous incised spiral lines of about equal strength which are much more closely spaced near the umbilicus than the periphery, the distance between the succeeding striations diminishing in regular ratio from the periphery to the umbilical area, the first two below the periphery being considerably more distantly spaced than the rest, the spaces inclosed between them being about equal to the space inclosed between the spiral lines on the spire. Aperture subquadrate, posterior angle acute, outer lip thin, showing the external sculpture within; columella slender, oblique, somewhat twisted and slightly revolute.

The type (Cat. No. 173081, U.S.N.M.) has 9 post-nuclear whorls and measures: Length 6.4 mm., diameter 2 mm. It was collected by Mr. H. N. Lowe at Long Beach, California. Another specimen is in the collection of the University of California from Station No. 122, near Redondo. Another (Cat. No. 176622, U.S.N.M.) was dredged by Mr. John Paine in 8 fathoms off Catalina Island. Five (Cat. No. 196230, U.S.N.M.) were collected by Mr. H. N. Lowe at San Diego, and four additional specimens from the same locality are in Mr. Lowe's collection. One, collected at Station No. 83, off San Diego, is in the collection of the University of California.

A specimen collected by Mr. S. S. Berry in 29 fathoms off New Monterey, Monterey Bay, California, is provisionally placed here until more material can be examined. It agrees with *T.* (*P.*) *morchi* in general form and type of sculpture, but is much more slender and has more ribs.

This species is nearest related to *Turbonilla* (*Pyrgiscus*) *latifundia* Dall and Bartsch, from the post-Pliocene of San Pedro, California.

TURBONILLA (PYRGISCUS) ANTESTRIATA, new species.

Plate XLV, figs. 4, 4*a*.

Shell large and strong, light brown. Nuclear whorls 2½, small, smooth, forming a depressed rounded helicoid spire, which projects somewhat beyond the left side of the outline of the spire of the later whorls and has its axis at a right angle to the axis of these, being about one-fourth immersed in the first turn. Post-nuclear whorls slightly rounded, ornamented by low, rounded, narrow, vertical axial ribs which become decidedly flattened and enfeebled near the summit of the turns; there are 9 of these ribs on the second, 20 upon the fifth, and 28 upon the penultimate post-nuclear turns. Intercostal spaces about double the width of the ribs, shallow, rounded, crossed by 6 equal and equally spaced, strongly incised, spiral lines which extend stronger upon the sides of the ribs and feebly over their summits. In addition to this sculpture, the spire is marked by many fine lines of growth and many fine spiral striations between the incised lines. Sutures well marked, simple. Periphery of the last whorl subangulated, marked by the feeble continuations of the axial ribs, which disappear at the periphery. Base short, marked by 11 continuous, equal, strong, incised spiral lines which are more closely spaced above the umbilical area than at the periphery; the space between the first basal incised line and the first supraperipheral one being a little wider than the space inclosed between the spiral lines on the spire. Aperture subquadrate, outer lip thin, showing the external sculpture within; columella almost straight and vertical, slightly revolute.

The above description is based upon 2 cotypes. One, an adult shell (Cat. No. 168867, U.S.N.M.), has the last 10 whorls, having lost the nucleus and probably the first two and one-half post-nuclear turns, and measures: Length 9.7 mm., diameter 2.8 mm. It was dredged by the U. S. Bureau of Fisheries steamer *Albatross* at Station No. 3194 in 92 fathoms, on gray sand, bottom temperature 45.° 9, off Esteros Bay, California. The other (Cat. No. 196232 U.S.N.M.) was collected by Mrs. Oldroyd at San Pedro, California, and has the nucleus and 9 post-nuclear turns, and measures: Length 5.5 mm., diameter 1.8 mm. Three specimens (Cat. No. 196233, U.S.N.M.) were dredged by the Fisheries steamer *Albatross* at Station No. 2902 in 53 fathoms, fine gray sand and mud bottom, temperature 45°, off Santa Rosa Island. One in the collection of the University of California comes from Station No. 122, near Redondo; another in the same institution was dredged at Station No. 12, off Point Vincent. Two (Cat. No. 196231, U.S.N.M.) were dredged in 12 fathoms at San Pedro by Mr. H. N. Lowe. Another specimen was dredged by the University of California at Station No. 30, off Catalina Island, and two at Station No. 58, off San Diego, California, the last two lots being in the University collection.

TURBONILLA (PYRGISCUS) EUCOSMOBASIS, new species.

Plate XLV, figs. 8, 8*a*.

Shell quite large, of very regular outline, creamy white. Nucleus rather small, composed of 2½ whorls, helicoid with much depressed spire, somewhat obliquely about one-third immersed in the first of the succeeding turns, the axis of the nuclear spire being almost at a right angle to the axis of the later whorls. Post-nuclear whorls moderately rounded, widest a little above the suture, sloping gently toward the summit and more abruptly toward the base, ornamented by moderately strong, rounded, somewhat flexuous, axial ribs, of which about 18 appear upon the second, 20 upon the seventh, 22 upon the eighth, and

27 upon the penultimate whorl. Intercostal spaces only moderately deep, a little wider than the ribs, marked by 6 strong incised spiral lines which extend up on the sides of the ribs and frequently pass over their summits; the uppermost or posterior one of these incised lines is least pronounced, the second one above the suture, and the third one about half again as far apart as the remaining, which are equally spaced. In addition to these the shell is marked by many faint wavy spiral striations between the deep ones. Sutures plain, well defined. Base of the last whorl very short, well rounded, marked by the faint continuations of the axial ribs and about 15 well defined more or less equally spaced deep spiral striations with fainter ones between them as on the exposed portion of the whorls of the spire; the first deep basal spiral striation and the one above the suture are some little distance apart and mark a plain band excepting the fainter sculpture. Aperture quite large, subquadrate; columella short, somewhat twisted, revolute.

The type (Cat. No. 162679, U.S.N.M.) was dredged by the U. S. Bureau of Fisheries steamer *Albatross* at Station No. 2902, off Santa Barbara, California, in 53 fathoms. It has 12 post-nuclear whorls which measure: Length 11.2 mm.; diameter 2.8 mm.

Another specimen (Cat. No. 162680, U.S.N.M.) was dredged at Station No. 3195, in 252 fathoms, on green mud, bottom temperature 43°.2, in San Luis Obispo Bay, California. Four specimens (Cat. No. 162681) were dredged at Station No. 2901 on grey sand and mud bottom, at a depth of 48 fathoms, temperature 55°.1, off Santa Rosa Island. The University of California has two lots, one specimen dredged at Station No. 32, off Catalina Island, and two from Station No. 59, off San Diego, California.

TURBONILLA (PYRGISCUS) TENUICULA Gould.

Plate XLV, figs. 3, 3*a*.

Chemnitzia tenuicula Gould, Bost. Jour. Nat. Hist., VI, 1853, pp. 383, 384, pl. XIV, fig. 15.

Turbonilla (*Pyrgiscus*) *tenuicula* Gould, Mem. Cala. Acad., III, 1903, pp. 275–276, pl. II, figs. 7, 7*a*.

Shell small, elongated, lanceolate, turrited, rather solid, shining, wax yellow, a little dusky below the suture; whorls 10, flat, slightly shouldered above, marked by about 20 direct, longitudinal folds, the summits of which are cut by numerous fine revolving striæ, deeper in the interstices, which also extend over the base of the shell, though the folds terminate at the periphery, or are extended in delicate furrows; aperture narrow, ovate; lip sharp; revolving striæ apparent within.

Dimensions.—Length 7.5 mm.; diameter 1.3 mm.

Found at Santa Barbara.

The above is the original description by Gould. *Turbonilla* (*Pyrgiscus*) *tenuicula* Gould is the most abundant and most variable species of all the west American forms, presenting many varieties or incipient species; to describe these would not aid science or the collector, but would only add to the confusion which this paper is intended to dispel. The following comprehensive description will embrace, we believe, all the forms coming under this name:

Shell slender to somewhat stubby and inflated, varying in color from milk-white to waxy yellow or to dark brown, variously banded or plain monocolored; nuclear whorls three, moderately large, planorboid, slightly slantingly immersed; post-nuclear whorls rounded to flattened, contracted at base and strongly shouldered at the summit, traversed by 18 to 28 strong vertical ribs, which are excurved and usually somewhat thickened, and connected at their summits, which appear beaded; these ribs extend feebly over the rounded base of the last whorl; the entire shell is crossed by incised spiral lines, 10 to 16 or more of which appear on the exposed portion of the whorls, and more, closer placed, wavy ones on the base of the last whorl; the suture is deep, subchanneled and wavy; aperture ovate, produced at base; outer lip thin, meeting the oblique, slightly curved and revolute columella in a broad curve; a faint callus connects the posterior angle of the aperture with the insertion of the columella.

Dimensions.—Length 6.5 mm.; diameter 1.9 mm.

The specimen figured is from Todos Santos Bay, Lower California, and has 9 post-nuclear whorls. One of the same number of whorls from San Pedro measures: length 6.2 mm.; diameter 1.7 mm.

The U. S. National Museum contains the following specimens:

Specimens of Turbonilla (Pyrgiscus) tenuicula Gould.

Number of specimens.	Locality.	Collector.	Catalogue No.
2	Monterey, California	P. P. Carpenter	32245
1	Santa Barbara, California	Colonel Jewett	*a* 16267
2	San Pedro, California	E. W. Roper	151724
1	do	Mrs. T. S. Oldroyd	196227
25	do	do	196226
2	do	Mrs. Johnston	152198
1	do		160480
7	do	F. L. Button	191547
1	Pacific beach, San Diego	H. Hemphill	192228
3	San Diego	Stearns collection	46504
7	San Diego, ocean beach	F. W. Kelsey	153065
2	San Diego	do	*b* 153049
2	do	C. R. Orcutt	60933
5	do		160481
1	Point Abreojos, Lower California	H. Hemphill	105585
2	do	do	106510
7	Todos Santos Bay, Lower California	Stearns collection	32284

TURBONILLA (PYRGISCUS) CASTANEA, new species.

Plate XLVII, fig. 7.

Shell very large, stout and heavy, chestnut brown. Nuclear whorls decollated. Post-nuclear whorls well rounded, ornamented by many broad, flattened, more or less regular, and evenly placed retractive axial ribs, of which about 22 appear upon the third, 26 upon the fifth, and

40 upon the seventh whorl. On the penultimate and antepenultimate whorls they are more or less irregular in form, number, and spacing. Intercostal spaces much narrower than the ribs. The spiral sculpture consists of 8 deep, quite regularly spaced lines of pits which are very pronounced in the intercostal spaces and on the sides of the ribs, but do not appear to cross their summits except on the penultimate and the last whorl. Sutures well defined, simple. Periphery and base of the last whorl evenly rounded, the latter ornamented by the prolongation of the axial ribs and quite a number of continuous well-impressed spiral lines with faint spiral striation between them. Aperture suboval, somewhat effuse anteriorly, posterior angle obtuse (outer lip fractured, very thick); columella strong, slightly curved and strongly revolute with a weak, very oblique internal fold near its insertion; parietal wall and umbilical region covered by a weak callus. Columella and extreme anterior portion of the aperture white.

The type (Cat. No. 74000, U.S.N.M.) belongs to the Stearns collection and was obtained at Monterey, California. It has 10 postnuclear whorls (the nucleus and perhaps the first three being lost), and measures: Length 13.5 mm., diameter 3.7 mm.

This species is remarkable for being the largest known member of the section *Pyrgiscus* on the west coast of America.

Subgenus **MORMULA** A. Adams.

Mormula A. Adams, Journ. Linn. Soc. London, VII, 1864, p. 1;=*Pyrgostylus* Monterosato, Il. Nat. Hist. Sicil., 1884, p. 90.

Turbonillas having vertical ribs and deeply incised spiral lines; also irregularly disposed varices on the outer surface, which usually mark internal lirations on the outer lip. Sculpture never nodulose.

Type.—Mormula rissoina A. Adams.

KEY TO SPECIES OF MORMULA.

Adult shell more than 20 mm .... *lordi.*
Adult shell less than 15 mm.
    Deeply incised lines on the whorl between the sutures: 5 .... *tridentata.*
    Deeply incised lines on the whorl between the sutures: 12 .... *eschscholtzi.*

TURBONILLA (MORMULA) LORDI E. A. Smith.

Plate XLV, figs. 7, 7*a*.

Chemnitzia lordi E. A. Smith, Ann. Mag. Nat. Hist., VI, 1880, p. 288.

Shell very large, light brown to pale yellowish-white, variously banded. Nuclear whorls two, smooth, helicoid, moderately elevated, having their axis at right angles to the axis of the succeeding turns and about one-fourth immersed in the first of them. Postnuclear whorls well rounded, ornamented by heavy, broad, low axial ribs, of which about 14 occur upon the second, 16 upon the eighth, 22 upon the eleventh, and 30 upon the penultimate whorl. Intercostal spaces not deeply depressed, about as wide as the ribs, ornamented by about 12 to 15 irregularly spaced spiral striations between the sutures; those near the summit of the whorls are closer and more feeble than those near the periphery of the whorls. Sutures strongly impressed, somewhat wavy. Periphery of the last whorl somewhat angulated in young specimens, moderately well rounded in adults. Base rather short, marked by faint continuations of the axial ribs and faint wavy spiral striation. Aperture subrhombic, posterior angle obtuse, outer lip thin, showing the external sculpture and banding within; columella stout, slightly twisted and revolute, provided with an oblique internal fold. The color markings in the specimen here described and figured consist of a pale yellowish-brown band, about a quarter of the width of the whorl between the sutures, covering the posterior part, followed by a narrow band of the yellowish-white ground color, which is followed by a band of brown a little darker than the first and about as wide as the last-named white band; then a broad pale white band, lastly a narrow pale yellow one above the periphery finishes the marking between the sutures. The periphery is marked by a narrow band of white followed by a deep brown one which shades gradually to the white about the umbilical region.

The characters which ally this species to *Mormula* are only feebly developed, now and then two ribs become fused and suggest a varix; the internal lirations, too, are only very feebly expressed and appear in the aperture of only one specimen. The specimen figured has 14 post-nuclear whorls and measures: Length 20.8 mm., diameter 5.1 mm.; it was collected in 12 fathoms at Sitka Harbor, Alaska, and is Cat. No. 160492, U.S.N.M. No. 160069, U.S.N.M., contains 7 individuals from the same locality; No. 133234, U.S.N.M., has 2 from Port Orchard, Washington, and No. 4480, U.S.N.M., 1 from Puget Sound, Washington. Seven specimens were collected by Rev. G. W. Taylor at Banks Island, British Columbia. One of these, a young individual, Cat. No. 196234, U.S.N.M., has furnished the description of the nucleus. It has 9 post-nuclear whorls and measures: Length 5.2 mm., diameter 2.1 mm.

This is the largest species known from the west coast of America.

TURBONILLA (MORMULA) TRIDENTATA Carpenter.

Plate XLV, fig. 9.

Chemnitzia tridentata CARPENTER, Jour. de Conch., XIII (3d ser., V), 1865, p. 147.—*Turbonilla* (*Lancea*) *tridentata* DALL and BARTSCH, Mem. Cala. Acad., III, p. 273, 1903, pl. II, figs. 1, 1*a*.

Shell large, broad; chestnut colored, obscurely banded; nuclear whorls three, helicoid, about one-third immersed, scarcely extending beyond the margin of the spire, their axis being at a right angle to the axis of the later whorls. Post-nuclear whorls slightly convex, somewhat contracted at the periphery and slightly shouldered at the summit; traversed by about 20 to 24 strong, well-rounded, somewhat oblique axial ribs, which continue faintly over the decidedly angular periphery of the last whorl and the base to the umbilical region; these ribs are considerably enfeebled on the last whorl of old shells and frequently become almost obsolete on these. The exposed portion of the whorls is traversed by five spiral grooves, which appear most prominently in the shallow and broad intercostal spaces, and less so on the ribs; these deep spiral lines are regularly spaced, leaving a broader interval on the middle of the exposed portion of the whorl; the base of the last whorl is likewise ornamented by spiral grooves, but here they appear less developed than on the spire. In addition to this the entire surface of the shell is marked by numerous very fine, somewhat wavy, spiral and axial striæ, which show most prominently on the last whorl and base, and give the shell a very minutely reticulated secondary sculpture. At irregular intervals the whorls are marked by thick callous varices, which are usually of a lighter color than the remainder of the shell. Aperture large, subquadrate; posterior angle acute; outer lip thin, having three strong internal lirations, joining the whitish, short, straight, revolute columella at a little less than a right angle. By transmitted light two spiral, light color-bands become apparent on the inside of the lip, each of which is bordered by a zone of a darker color than the remaining shell. The general color effect of the exterior is that of a flesh-colored shell, covered by a dark epidermis, which is stretched tight over the ribs, permitting the lighter color beneath to shine through it at their summits.

Doctor Carpenter's type (Cat. No. 15315*b*, U.S.N.M.) was collected at Monterey, California. It has 11 post-nuclear whorls and measures: Length 11.1 mm., diameter 3.2 mm. The specimen figured (Cat. No. 150983, U.S.N.M.) is from San Pedro, California. It has 13 post-nuclear whorls and measures: Length 12.8 mm., diameter 3.6 mm.

The U. S. National Museum has five lots of this species: Cat. No. 15315*b* is the type from Monterey, California; Cat. No. 196239, four specimens dredged by the Bureau of Fisheries steamer *Albatross* at station No. 2902, off Santa Rosa Island, in 53 fathoms, fine gray sand and mud, with a bottom temperature of 45°; Cat. No. 196240, ten specimens from San Pedro, collected by Mrs. T. S. Oldroyd; Cat. No. 150983, three individuals, one of which is figured, dredged by Mrs. Oldroyd in 4 fathoms, at San Pedro; Cat. No. 46505, two shells from San Diego in the Stearns collection. In addition to these, specimens have been determined for Mr. Berry, from Monterey, 12 to 39 fathoms; University of California, off Catalina Island; Mrs. Oldroyd and Mr. Lowe, at San Pedro; Mr. Kelsey and Mr. Arnold, from San Diego.

TURBONILLA (MORMULA) ESCHSCHOLTZI, new species.

Plate XLV, fig. 10.

Shell large, elongate-conic, brown, having three obscure bands of dark brown, one of which is at the summit, another at the periphery, while the third is halfway between these on the exposed portion of the whorl of the spire. Nuclear whorls decollated. Post-nuclear turns moderately rounded, ornamented by low, rounded, rather distantly spaced, slightly protractive axial ribs which become weakened and somewhat flattened as they approach the appressed summit, and many fine lines of growth both on the ribs and in the intercostal spaces. In addition to the axial sculpture the whorls are crossed by twelve deeply incised, somewhat irregularly spaced spiral lines, the raised spaces between which are again divided by many fine striæ. All the spiral markings pass over the intercostal spaces and the ribs. Periphery of the last whorl obscurely angular, marked by the feeble continuations of the ribs which vanish immediately below the periphery and the usual fine lines of growth and spiral striation. Base rather short, well rounded, brown, with a narrow whitish band about the umbilicus, marked by closely spaced continuous wavy spiral striation, which varies in strength, several finer striæ alternating with the stronger. Aperture subquadrate, outer lip thin, showing four narrow dark-brown bands within, upon a lighter background—these are the three already referred to—and a fourth one on the base adjoining the periphery; columella almost vertical, slightly twisted and revolute.

The type (Cat. No. 196241, U.S.N.M.) was collected by Rev. G. W. Taylor, at Carter Bay, British Columbia; it has 11 post-nuclear whorls (the nucleus and probably three of the post-nuclear whorls being lost), and measures: Length 13.3 mm., diameter 4 mm. Another specimen from the same locality is in the Taylor collection. Three additional lots were collected by him in British Columbia; one, a fragment, from west of Rose Spit, Queen Charlotte Islands; 6 at Departure Bay, one of which is Cat. No. 196242, U.S.N.M.; 15 at Port Simpson, 5 of which are Cat. No. 196243, U.S.N.M. No. 196242 is the largest specimen, it has 12½ whorls, having lost the nucleus and probably the first three of the succeeding turns and measures: Length 17.8 mm., diameter 4.5 mm.

Genus ODOSTOMIA Fleming.

Odostomia FLEMING, Edinburgh Encyc., VII, 1813, Pt. 1, p. 76—*Odontostomia* JEFFREYS, Mal. and Conch. Mag., 1839, p. 33.—*Turritostomia* SACCO, Moll. del Piemonte e del Liguria, 1892, p. 41.

Shell with sinistral apex, usually short, few whorled, subconic or ovate, with a single columellar fold which varies in strength and sometimes is not apparent at the aperture.

Type.—Turbo plicatus Montagu.

The following 6 of the 41 subgenera and sections of *Odostomia* are represented in the present faunal area: *Chrysallida*, *Ividia*, *Iolaea*, *Menestho*, *Evalea*, and *Amaura*.

KEY TO SUBGENERA OF ODOSTOMIA.

Sculpture nodulose...*Chrysallida*, p. 514.
Sculpture consisting of axial and spiral lamellæ.........................*Ividia*, p. 517.
Sculpture consisting of spiral lirations and slender axial threads in the depressed spaces:
    Shell umbilicated...*Iolaea*, p. 518.
    Shell not umbilicated...*Menestho*, p. 520.
Sculpture consisting of spiral striation only:
    Shell very large..*Amaura*, p. 528.
    Shell small...*Evalea*, p. 522.

Subgenus CHRYSALLIDA Carpenter.

Chrysallida Carpenter, Cat. Maz. Shells, 1857, p. 416.—*Noemia* De Folin, Fonds de la Mer, 1873, p. 314, not *Noemia* Pasco, 1857.—*Noemiamea* De Folin, Zool. Rec., 1885, p. 94 (Mollusca).

Odostomias having strong axial ribs crossed by equally strong spiral keels between the sutures, the intersection of these two elements forming nodules. The axial ribs pass only faintly over the base, while the spiral sculpture remains quite prominent.

Type.—Chrysallida communis Carpenter.

KEY TO SPECIES OF CHRYSALLIDA.

Spiral keels between the sutures 4.
    Sutures deeply channelled.
        Base with 7 narrow and slender spiral keels.......................*astricta*.
        Base with 8 broad and rounded spiral keels........................*cooperi*.
    Sutures not channelled..*montereyensis*.
Spiral keels between the sutures on the last whorl more than 5..........*oregonensis*.

ODOSTOMIA (CHRYSALLIDA) COOPERI, new species.

Plate XLVI, fig. 7.

Shell broadly conic, white. Nuclear whorls smooth, largely obliquely immersed in the first of the succeeding turns above which only about half of the last turn projects. Postnuclear whorl moderately rounded, slopingly shouldered at the summit, the shoulder bearing the first of the four stronger tuberculate spiral ridges. The connections which join the tubercles in the spiral series are a little more strongly developed than those which link them vertically, the spaces inclosed between them being deep squarish pits. The tubercles are very prominent and rounded, there are about 16 upon the second, 20 upon the third, and 26 upon the penultimate turn. The axial series slants retractively from the posterior suture. Sutures deep and broad, considerably wider than the spaces between the keels. Periphery of the last whorl deeply channelled, the channel marked by a weak extension of the axial bars which terminate at the first supra-peripheral keel. Base prolonged, well-rounded, marked by seven strong moderately raised, spiral keels which, like the channels that separate them, diminish regularly in width from the periphery to the umbilical area; the last, the eighth, immediately behind the columella, being less distinct and considerably broader than the rest. The channels between the keels are about equal to the keels in width and are crossed by numerous very slender raised threads, which extend up on the sides of the keels but do not cross them. About five of these threads fall in the space between two tubercles on the spire, in the first supra-peripheral groove. Aperture oval, large, effuse anteriorly, posterior angle obtuse, outer lip rather thick, not showing the external sculpture within; columella somewhat twisted, revolute anteriorly, reenforced by the attenuated base, and provided with a weak fold at its insertion; parietal wall covered by a callus which joins the columella with the posterior angle of the aperture and renders the peristome almost complete.

The type (Cat. No. 162771, U.S.N.M.) was collected by Doctor Dall at Monterey, California. It has five postnuclear whorls and measures: Length, 3.1 mm.; diameter, 1.4 mm.

ODOSTOMIA (CHRYSALLIDA) ASTRICTA, new species.

Plate XLVI, fig. 1.

Shell elongate-conic, bluish-white. Nuclear whorls decollated. Postnuclear whorls very slightly rounded, separated by deeply channelled sutures. In this species the vertical ribs exceed the four spiral keels in strength, their junction forming elongated tubercles the long axis of which coincides with the spiral keels. The vertical ribs, of which there are 16 upon all of the turns, slant decidedly backward toward the aperture. They are rather distantly spaced and the spaces inclosed between them and the spiral keels are deep oblong pits, the long axis of which coincides with the spiral sculpture. Periphery of the last whorl marked by a deep, wide channel across which the ribs extend feebly to the first subperipheral keel. Base rather long and well rounded, marked by seven rather narrow, slender spiral keels which successively decrease in strength from the periphery to the umbilical area, the anterior ones being only faintly indicated; the spaces which separate the keels are about twice as wide as the keels and are crossed by many very slender raised vertical threads. Aperture oval, outer lip rather thick, columella twisted, reenforced by the attenuated base and provided with a moderately strong fold at its insertion; parietal wall covered by a strong callus.

The type (Cat. No. 196280, U.S.N.M.) was collected by Mr. F. L. Button at Monterey, California; it has the 6 last whorls remaining, having lost the nucleus and probably the first post-nuclear turn, and measures: Length, 2.9 mm.; diameter, 1.2 mm.

ODOSTOMIA (CHRYSALLIDA) MONTEREYENSIS, new species.

Plate XLVI, fig. 4.

Shell broadly conic, milk-white to subdiaphanous. Nuclear whorls smooth, largely immersed in the first of the succeeding turns, above which only half of the last whorl projects. Postnuclear whorls separated by broad, deep sutures; well rounded between the sutures where they are ornamented by four strongly tuberculate spiral ridges, the spiral connections between the tubercles are equal to the axial connections or ribs, of which 16 appear upon the second, 18 upon the thirtieth, and 20 upon the penultimate whorl. The spaces inclosed between the axial ribs and the spiral connections which join the rounded tubercles are deep squarish pits. The axial ribs extend strongly across the deep peripheral channel and stop at the first subperipheral keel. Base moderately long, well rounded, marked by 5 equal and subequally spaced, well raised, strong, spiral keels, and a sixth, much broader, low, and rounded at the columellar margin. The grooves between the keels are equal to the width of the keels near the periphery, but diminish in breadth successively from the periphery to the umbilical area. They are crossed by numerous slender raised axial threads, which extend up on the sides of the spiral keels, but do not cross them. There are about 5 of these threads between each two ribs in the first subperipheral channel; aperture oval, somewhat effuse anteriorly; posterior angle acute; columella reenforced by the attenuated base, against which it appears like a thickened callus, provided with a moderately strong oblique fold at its insertion; parietal wall covered by a thick callus, which joins the columella with the posterior angle of the aperture.

The type (Cat. No. 196281, U.S.N.M.) has 5 postnuclear whorls and measures: Length, 3.0 mm.; diameter, 1.3 mm. It was collected by Mr. S. S. Berry, in 12 fathoms, off Del Monte, Monterey Bay, California. Three specimens from the same station are in Mr. Berry's collection. Another specimen (Cat. No. 74003, U.S.N.M.) was collected by Doctor Canfield at Monterey, and a sixth (Cat. No. 196282, U.S.N.M.) by Mr. F. L. Button at the same place. A seventh (Cat. No. 162767, U.S.N.M.) was collected by Mrs. T. S. Oldroyd at San Luis Obispo, California.

ODOSTOMIA (CHRYSALLIDA) OREGONENSIS, new species.

Plate XLVI, figs. 10, 10*a*.

Shell elongate-conic, slender, subdiaphanous to milk-white. Nuclear whorls immersed, the last one only being visible. This is somewhat tilted and marked by three strong narrow spiral keels and many slender raised axial threads which cross the grooves between the keels. Postnuclear whorls well rounded, slopingly shouldered at the summit and separated by constricted sutures, ornamented by almost equal and equally spaced spiral keels and axial ribs between the sutures on the spire. There are 4 spiral keels on the first, second, and third whorls, 6 on the fourth, and 7 upon the penultimate whorl. The first of these keels is on the shoulder of the whorl near the summit and is somewhat less developed than the rest. The axial ribs are best developed on the early whorls, where they extend equally strong from the summit to the periphery; on the antepenultimate and penultimate turns they become somewhat enfeebled from the middle of the whorl between the sutures to the periphery. There are about 16 of these ribs on the first, 18 on the third, 20 upon the fourth, and 22 upon the penultimate turn. The intersections of the ribs and spiral keels form low elongated tubercles, the long axis of which coincides with the spiral sculpture. The meshes inclosed by the keels and ribs are deeply impressed squarish pits. Periphery and base of the last whorl well rounded, the latter somewhat inflated and marked by 6 spiral cords which are successively closer spaced and a little less strongly developed from the periphery to the umbilical area. The channels between the cords are crossed by many very slender raised vertical threads. Aperture oval, slightly effuse anteriorly; outer lip thin; columella reenforced on its posterior two-thirds by the attenuated base, free and somewhat revolute anteriorily; parietal wall glazed by a thin callus.

The type has 6 postnuclear whorls and measures: Length 3.3 mm., diameter 1.2 mm. It and 9 additional specimens are Cat. No. 107690, U.S.N.M., and were collected by Dr. C. F. Newcombe at Cumshewa Inlet, Queen Charlotte Island, British Columbia, in 10 fathoms. Two other lots of one specimen each come from Monterey, Cat. No. 73998, U.S.N.M., in the Stearns collection, and Cat. No. 196283, U.S.N.M., collected by Mr. F. L. Button.

Subgenus IVIDIA Dall and Bartsch.

Ividia DALL and BARTSCH, Proc. Biol. Soc., Washington, 1904, XVII, p. 11.

Shell sculptured with lamellose axial ribs and spiral keels, their intersections not nodulose.

Type.—Parthenia armata Carpenter.

ODOSTOMIA (IVIDIA) NAVISA, new species.

Plate XLVI, figs. 2, 2*a*.

Shell of medium size, strongly sculptured, subdiaphanous to milk-white. Nuclear whorls at least 2, obliquely a little more than half immersed. Postnuclear whorls strongly shouldered, subtabulated, with a strong broad spiral keel limiting the anterior edge of the shoulder and an acute raised keel on the middle of the whorls between the sutures, while a third equally acute keel marks the periphery of the last whorl. Two other keels ornament the base, the anterior one of which is not quite as strong as its neighbor. The axial sculpture consists of narrow, more or less lamellar, almost vertical ribs, which render the intersection with the spiral keels somewhat thickened but not nodulose. These axial ribs extend over the periphery and base of the last whorl to the umbilical region, gradually growing weaker as they approach this point. There are about 18 on the second and 20 upon the penultimate whorl. The spaces between the ribs and keels appear as concave quadrangular depressions. Umbilicus narrowly perforated. Suture deeply channeled by the shouldered whorl. Aperture suboval, posterior angle decidedly obtuse; outer lip thick, marked by 5 projections, corresponding to the 5 keels; columella almost straight, strongly revolute with a conspicuous oblique fold near its insertion; parietal wall covered by a faint callus showing both basal keels, the anterior faint and just posterior to the insertion of the columella and the next on the middle of the wall.

The type has 5 postnuclear whorls and measures: Length 2.7 mm., diameter 1.3 mm. It and 3 additional specimens (Cat. No. 106502, U.S.N.M.) were collected by Mr. Henry Hemphill at Scammons Lagoon, Lower California. Three additional lots are in the U. S. National Museum collection: Cat. No. 129336, 30 specimens collected by Mrs. T. S. Oldroyd in the drift at San Pedro; Cat. No. 162843, 3 specimens also from San Pedro by the same donor; Cat. No. 62844, 1 specimen collected by Mr. Henry Hemphill at Ocean Beach, San Diego, California.

ODOSTOMIA (IVIDIA) NAVISA DELMONTENSIS, new subspecies.

Plate XLVI, figs. 3, 3*a*.

Shell similar to *O.* (*I.*) *navisa* but more elongate, and in every way more delicate with the lamellose sculpture reduced almost to raised cords and with stronger shouldered summits and more open umbilicus.

The type (Cat. No. 196297, U.S.N.M.) was collected by Mr. S. S. Berry in 12 fathoms, off Del Monte, Monterey Bay, California. It has 5 postnuclear whorls and measures: Length 3.2 mm., diameter 1.3 mm.

Subgenus IOLAEA A. Adams.

Iolaea A. Adams, Proc. Zool. Soc., 1867, p. 310.—*Iole* A. Adams, Ann. Mag. Nat. Hist., 3d ser., V, 1860, p. 300, not *Iole* Blyth, Journ. Asiat. Soc. Beng., XIII, Pt. 1, 1844, p. 386.

Shell umbilicated, marked by spiral cords, and axial riblets which cross the grooves between them.

Type.—*Iole scitula* A. Adams.

ODOSTOMIA (IOLAEA) AMIANTA, new species.

Plate XLVI, figs. 9, *9a*.

Shell broadly conic, yellowish-white. Nucleus small, of two whorls which increase extremely rapidly in size and are obliquely placed. Postnuclear whorls very strongly shouldered, marked by 3 very strong lamellar spiral keels on the first and second and 4 on the succeeding whorls between the sutures. The posterior keel marks the limit of the broad, sloping shoulder and is much the strongest. It is also placed a little farther apart from the next spiral keel than that is from its anterior neighbor. Base of the last whorl well rounded; ornamented by 8 spiral ridges, which are less elevated and much more closely and regularly spaced than those between the sutures. The peripheral groove is about equal in width to the one anterior to the posterior keel. The entire shell is marked by fine, sublamellar, regularly spaced, retractive axial ribs, which render the spiral keels somewhat crenulated at their meeting points and break the spaces between them into small squares or oblongs. These riblets extend from the sutures to the small umbilicus. Aperture subovate, posterior angle obtuse; outer lip thin, somewhat wavy, showing the external sculpture within; columella moderately stout, somewhat curved and strongly revolute, having an oblique fold near its insertion which is barely visible when the aperture is viewed squarely; parietal wall covered by a fairly thick callus.

The type and another specimen (Cat. No. 105483, U.S.N.M.) were collected at Point Abreojos, Lower California, by Mr. Henry Hemphill. It has 6 post-nuclear whorls and measures: Length 4.4 mm., diameter 2.3 mm.

Specimens of Odostomia (Iolaea) amianta Dall and Bartsch.

No. of specimens.	Locality.	Collector.	Catalogue No.
1	Monterey Bay	Rev. G. W. Taylor	No. 37253 U.S.N.M.
6	Monterey, off Del Monte (12 fathoms).	S. S. Berry	S. S. Berry's collection.
1	do	W. H. Dall	No. 168683 U.S.N.M.
1	San Pedro	Mrs. T. S. Oldroyd	No. 168684 U.S N.M.
1	San Pedro, Long Beach	H. N. Lowe	No. 196298 U.S.N.M.
1	San Pedro, station 83	University of California	University of California collection.
1	Off Catalina Island, station 28.	do	Do.
5	Off Catalina Island, station 30.	do	Do.
11	San Diego, station 47.	do	Do.
2	do	F. W. Kelsey	No. 160115 U.S.N.M.
1	do	Henry Hemphill	No. 105469 U.S.N.M.
1	Off Coronado Island, 20 fathoms; bottom temperature 58°.	U. S. F. C. station (2932)	No. 168685 U.S.N.M.
2	Point Abreojos, Lower Cal	Henry Hemphill	No. 105483 U.S.N.M. (1=type).

Subgenus MENESTHO Möller.

Menestho Möller, Ind. Moll. Greenl., 1842, p. 10.

Shell not umbilicated, marked by moderately well-developed and usually equally spaced spiral cords; axial sculpture reduced to mere lines of growth which frequently appear as *very slender* raised threads in the grooves between the cords.

Type.—Turbo albulus Fabricius.

KEY TO SPECIES OF MENESTHO.

Spiral sculpture very regular and equally spaced.
  Shell large, adult over 3.5 mm. in length ....*exara.*
  Shell very small, adult under 2.5 mm. in length ....*pharcida.*
Spiral sculpture irregular, not equally spaced ....*harfordensis.*

ODOSTOMIA (MENESTHO) PHARCIDA, new name.

Plate XLVI, fig. 8.

Mumiola tenuis Dall, Bull. Nat. Soc. Brit. Col., 1897, p. 14, pl. I, fig. 10. *Not Odostomia tenuis* Carpenter, 1856; *not Odostomia tenuis* Jeffrey, 1884.

Shell small, subcylindric, yellowish-white. Nuclear whorls deeply immersed, a portion of the last and the penultimate only appear when viewed from the side; this gives the shell a truncated appearance. Post-nuclear whorls moderately well-rounded, rather wide between the sutures, and somewhat shouldered at the summits; ornamented by strong, low, rounded spiral cords, which are separated by moderately deep, narrow, depressed channels. Six of these cords occur upon the first, 7 upon the second to the penultimate whorl between the sutures; the posterior cord is a little broader and less elevated than the rest, while some of those on the penultimate turn show a tendency to divide, that is, a faint spiral line is apparent on the middle of some of these cords. Sutures well impressed. Periphery and base of the last whorl well rounded, the latter ornamented by 8 rounded spiral cords similar to those between the sutures. The spaces between the spiral ridges on the base and between the sutures are marked by closely placed, exceedingly slender, raised axial threads. Aperture pyriform, somewhat effuse anteriorly, posterior angle acute; columella short, curved, reenforced by the attenuated base, free only at its extreme anterior end, with an oblique fold near its insertion; parietal wall covered by a thin callus.

The type (Cat. No. 107440, U.S.N.M.) was dredged by Dr. C. F. Newcombe, in 10–15 fathoms, at Cumshewa Inlet, Queen Charlotte Island, British Columbia. It has 4 postnuclear whorls, which measure: Length 2.2 mm., diameter 0.9 mm.

ODOSTOMIA (MENESTHO) HARFORDENSIS, new species.

Plate XLVI, fig. 5.

Shell elongate-ovate, bluish-white. Nuclear whorls smooth, obliquely immersed in the first of the succeeding turns, only two-thirds of the last volution projects above them. Post-nuclear whorls well rounded, and somewhat inflated, marked by numerous incremental lines and 5 equally strong, but irregularly distributed, punctate, incised, spiral lines between the sutures. The two near the summit are placed closer to each other than any of the others, the space between the summits and the second line being about equal to the space inclosed between the first and second supra-peripheral lines. The third line falls on about the middle of the exposed portion of the whorls and is a little nearer to the second line than the one anterior to it. In addition to these 5 strongly incised lines there are numerous very fine and closely spaced spiral striæ which cross all parts of the surface of the shell. Periphery and base of the last turn inflated, the latter marked by lines of growth and 8 strongly incised, punctate spiral lines, which are a little less strongly impressed and a little more closely spaced at the umbilical area than at the peripheral part of the base. These lines equal those of the spire in strength. Sutures constricted. Aperture very large, somewhat effuse anteriorly; posterior angle acute; outer lip thin, showing the external sculpture within; columella curved, reenforced by the attenuated base and provided with a strong fold and its insertion; parietal wall covered by a thin callus.

The type (Cat. No. 196299, U.S.N.M.) was collected by Mrs. Merrihew, at Port Harford, California. It has 5 post-nuclear whorls and measures: Length 3.2 mm., diameter 1.8 mm.

ODOSTOMIA (MENESTHO) EXARA, new species.

Plate XLVI, fig. 6.

Shell elongate-ovate, subdiaphanous. Nuclear whorls smooth, deeply immersed in the first of the succeeding turns, only a part of the last one appearing above it. Post-nuclear whorls somewhat inflated, well rounded, marked on the first whorl by 8, on the second by 12, on the third by 14, and on the penultimate between the sutures by 20 subequal and equally spaced, low, depressed spiral cords which are separated by narrower channels. Periphery and base of the last whorl inflated, sculptured like the spire by probably 20 spiral cords. In addition to the spiral sculpture the entire surface is marked by fine incremental lines which are best marked in the spaces between the cords. Aperture oval, somewhat effuse anteriorly; posterior angle acute; outer lip thin, showing the external sculpture within; columella decidedly curved, reenforced by the attenuated base, free only at its anterior extremity, where it is somewhat revolute, provided with a prominent fold at its insertion which appears as the thickened inflection of the columella; parietal wall covered by a thin callus

The type (Cat. No. 196250, U.S.N.M.) comes from Pacific Grove, Monterey, California. It has 5 post-nuclear whorls and measures: Length 3.9 mm., diameter 2.1 mm.

Subgenus EVALEA A. Adams.

Evalea A. ADAMS, Ann. Mag. Nat. Hist., VI, 1860, p. 22; +*Ondina* DE FOLIN, Fonds de la Mer, 1870, p. 214; +*Auriculina* GRAY, Proc. Zool. Soc., 1847, p. 159; +*Ptychostomon* LOCARD, Prod. de les Moll. de France, 1886, p. 228.

Odostomias having the surface marked by fine incised spiral lines.

Type.—*Evalea elegans* A. Adams.

KEY TO SPECIES OF EVALEA.

- Shell umbilicated .... *tillamookensis.*
- Shell not umbilicated.
  - Periphery of the last whorl decidedly angulated .... *angularis.*
  - Periphery of the last whorl subangulated.
    - Spiral sculpture uniform .... *jewetti.*
    - Spiral sculpture consisting of weak and strong lirations .... *inflata.*
  - Periphery of the last whorl well rounded.
    - Shell elongate-conic.
      - Adult shell more than 8 mm. long .... *columbiana.*
      - Adult shell less than 5 mm. long .... *deliciosa.*
    - Shell ovate.
      - Spiral sculpture uniform over the entire surface.
        - Diameter of adult shell 2.5 mm .... *tacomaensis.*
        - Diameter of adult shell 1.3 mm .... *valdezi.*
      - Spiral sculpture strongly developed on the early whorls, obsolete on the last.
        - Shell white, porcellanous .... *phanea.*
        - Shell straw-colored .... *tenuisculpta.*

ODOSTOMIA (EVALEA) TILLAMOOKENSIS, new species.

Plate XLVII, fig. 1.

Shell elongate-conic, thin, yellowish-white. Nuclear whorls surrounded by the first of the succeeding turns and so immersed as to give the apex a broadly truncated appearance. Post-nuclear whorls inflated, evenly strongly rounded, very slightly shouldered at the summit, separated by well-marked sutures. Periphery and base of the last whorl well rounded, the latter inflated, narrowly openly umbilicated. Entire surface marked by numerous fine, wavy, subequal, weakly incised spiral lines, of which about 35 occur between the summit and the periphery of the last whorl and about an equal number on the base. Aperture oval; outer lip thin; columella slender, evenly gently curved, and slightly revolute, free, not reenforced at the base, provided with a slender fold at its insertion, which is not visible when the aperture is viewed squarely.

The type (Cat. No. 196244, U.S.N.M.) has four post-nuclear whorls, and measures: Length 4.1 mm., diameter 2.2 mm. It was dredged by the U. S. Fisheries steamer *Albatross*, at Station No. 3346, off Tillamook, Oregon, in 786 fathoms, green mud, bottom temperature 37°.3.

ODOSTOMIA (EVALEA) ANGULARIS, new species.

Plate XLVII, fig. 2.

Shell very regularly elongate-conic, subdiaphanous to milk-white. Nuclear whorls small, deeply obliquely immersed in the first of the succeeding turns above which the tilted edge of the last turn only is visible. Post-nuclear whorls slightly rounded, separated by constricted sutures, marked by numerous slender, wavy, subequal and subequally closely spaced spiral striations, of which about 33 occur upon the last turn between the summit and the periphery. Periphery of the last whorl marked by a slender raised keel, decidedly angulated. Base short, moderately rounded, narrowly attenuated anteriorly to reenforce the columella, sculptured like the posterior portion of the whorls. Aperture ovate, very broad, slightly effuse anteriorly; posterior angle acute; columella very slender, evenly curved, closely appressed to the attenuated base, with a strong fold at its insertion which is barely visible when the aperture is viewed squarely.

The type has 7 post-nuclear whorls and measures: Length 5.6 mm., diameter 2.8 mm. It and four additional specimens (Cat. No. 150565, U.S.N.M.) were collected by Rev. G. W. Taylor at Nanaimo, British Columbia.

Five other lots are in the collection of the U. S. National Museum; Cat. No. 159474, one, collected by Doctor Dall at Sitka Harbor, Alaska; Cat. No. 126664, three specimens collected by Dr. C. F. Newcombe at Victoria, Vancouver Island, British Columbia; Cat. No. 43384, one specimen from Puget Sound; Cat. No. 161624, four from Port Harford, California, collected by Mrs. Merrihew; Cat. No. 196300, one, dredged by the Bureau of Fisheries steamer *Albatross* at Station No. 3194, off the California coast, in 92 fathoms, gray sand, bottom temperature 45°.9; 18 specimens were determined for Mr. S. S. Berry from 12 fathoms off Del Monte, Monterey Bay, California.

ODOSTOMIA (EVALEA) JEWETTI, new species.

Plate XLVII, fig. 3.

Odostomia inflata CARPENTER, part, Ann. Mag. Nat. Hist., XV, 1865, p. 394.

Shell elongate-ovate, white. Nuclear whorls very small, smooth, obliquely immersed in the first of the succeeding turns, above which only the last one is visible. Post-nuclear whorls well rounded, a little more abruptly so on the posterior third between the sutures. Summits very narrowly flattened which renders the sutures well marked. Periphery of the last whorl slightly angulated. Base slightly contracted, moderately rounded between the periphery and umbilical area, narrowly produced to reenforce the columella. Entire surface marked by numerous somewhat wavy, subequal and subequally spaced minute slender spiral lirations, of which there are about 35 between the summit and the periphery and an equal number between the periphery and the base on the last turn. Aperture large, patulous anteriorly; posterior angle acute, outer lip thin at the edge, thick within; columella curved, somewhat reflected, reenforced by the attenuated base, and provided with a strong oblique fold at its insertion.

The two cotypes (Cat. No. 15521*c*, U.S.N.M.) were collected by Colonel Jewett at Santa Barbara, California. One is a young specimen consisting of the nucleus and three post-nuclear whorls; the other has lost the nucleus and probably the first two post-nuclear turns; the five which remain measure: Length 6.1 mm., diameter 3.3 mm.

ODOSTOMIA (EVALEA) INFLATA Carpenter.

Plate XLVII, fig. 8.

Shell ovate, white. Nuclear whorls decollated. Post-nuclear whorls inflated, gently curved over the anterior two-thirds of the whorl between the sutures and more strongly so on the posterior third, this portion forming an evenly curved shoulder. Extreme summit of the whorls slightly flattened and narrow, rendering the sutures well marked. Periphery of the last whorl subangulated. Base attenuated, rather suddenly contracted below the periphery, which gives the space between the periphery and the umbilical area a concave aspect. Entire surface marked by fine lines of growth and many fine, closely placed spiral lirations, five of which are a little stronger than the rest and divide the space between the sutures into subequal areas. There are about 30 of these threads upon the last turn between the summit and the periphery and about 60 on the base. Aperture very large, patulous anteriorly; outer lip thin at the edge but very thick within; columella decidedly curved, and revolute, reenforced to the very edge by the attenuated base, provided with a strong oblique fold at its insertion.

The type and a young individual (Cat. No. 15521*b*) were collected by J. G. Swan at Neah Bay, Washington. It has the last four whorls (the nucleus and probably the first post-nuclear turn being lost) and measures: Length 6.2 mm., diameter 3.8 mm.

ODOSTOMIA (EVALEA) COLUMBIANA, new species.

Plate XLVII, fig. 9.

Shell large, elongate-conic, white. Nuclear whorls small, vitreous, planorboid, deeply obliquely immersed in the first of the succeeding turns, above which only the tilted edge of the last volution is visible. Post-nuclear whorls increasing regularly in size, well rounded, very narrowly roundly shouldered at the summits, which renders the sutures well marked. Periphery of the last whorl somewhat inflated. Base well rounded, attenuated anteriorly to reenforce the columella. Entire surface covered by numerous somewhat wavy, subequal and subequally closely placed spiral lirations, of which about 40 occur between the summit and the periphery and about an equal number on the base of the last whorl. Aperture large, decidedly patulous anteriorly; posterior angle acute; outer lip thin at the edge, very thick within; columella curved and strongly reflected, free only at its anterior extremity, provided with a strong oblique fold at its insertion.

The type and 5 specimens (Cat. No. 126658, U.S.N.M.) were collected by Dr. C. F. Newcombe at Victoria, Vancouver Island, British Columbia. It has 6 post-nuclear whorls and measures: Length 8.3 mm., diameter 4.2 mm. Three other specimens (Cat. No. 196245, U.S.N.M.) were dredged by the Bureau of Fisheries steamer *Albatross* at Station No. 4213, off Port Townsend, Washington, in 23 to 25 fathoms, gray sand and broken shell, bottom temperature 51°. Another (Cat. No. 196246, U.S.N.M) at Station No. 4203, at Fort Rupert, Vancouver Island, British Columbia, in 25 to 30 fathoms, volcanic sand and gravel and broken shell and sponge, bottom temperature 49.1°.

ODOSTOMIA (EVALEA) DELICIOSA, new species.

Plate XLVII, fig. 5.

Shell small, elongate-conic, translucent to milk-white. Nuclear whorls small, deeply immersed in the first of the succeeding turns above which only a portion of the last turn is visible. Post-nuclear whorls moderately rounded, very weakly roundly shouldered at the summit, separated by strongly marked sutures; a narrow band appears about the summit showing its junction with the preceding turn. Periphery and base of the last whorl inflated and well rounded. Entire surface of base and spire marked by very fine lines of growth and numerous microscopic wavy spiral striations. Aperture rather large, somewhat effuse anteriorly; posterior angle acute; outer lip thin; columella rather stout, strongly curved, and revolute, reenforced by the attenuated base, and covered with a strong fold at its insertion. This fold can be seen through the transparent shell as a quite strong lamella on the pillar of the turns.

The type (Cat. No. 46492, U.S.N.M.) is from Monterey, has 6½ post-nuclear whorls and measures, length 4 mm., diameter 1.9 mm. Another specimen (Cat. No. 196301, U.S.N.M.) also comes from Monterey, California.

ODOSTOMIA (EVALEA) TACOMAENSIS, new species.

Plate XLVII, fig. 10.

Shell ovate, yellowish. Nuclear whorls small, deeply immersed in the first of the succeeding turns. Post-nuclear whorls well rounded, faintly roundly shouldered at the extreme summits. Periphery of the last whorl rounded. Base inflated, well rounded, somewhat attenuated anteriorly. Surface covered by numerous equal and equally closely spaced slender wavy spiral striations of which there are about 40 between the summit and the periphery of the last whorl. Base marked like the space posterior to it. In addition to the spiral sculpture the entire surface of the shell is crossed by numerous fine lines of growth. Aperture moderately large, oval, well rounded anteriorly; posterior angle acute; outer lip thin; columella curved, slightly reflected, reenforced, except at its extreme anterior end, by the attenuated base and provided with a strongly oblique fold at its insertion.

The type (Cat. No. 159267, U.S.N.M.) has 5 post-nuclear whorls, and measures: length 4.3 mm., diameter 2.5 mm. It was collected by Mr. Fisher at Tacoma, Washington.

ODOSTOMIA (EVALEA) VALDEZI, new species.

Plate XLVIII, fig. 2.

Shell small, thin, very elongate-oval, subdiaphanous to milk-white, having the entire surface marked by rather strong lines of growth and numerous microscopic spiral striations. Nuclear whorls deeply obliquely immersed in the first of the succeeding turns, above which only the tilted edge of the last turn is visible. Post-nuclear turns rather high between the sutures, well rounded, with narrowly roundly shouldered summits. Periphery and base of the last turn inflated and well rounded, the latter with a very narrow umbilical chink. Aperture moderately large, oval; posterior angle acute; columella strongly curved, reenforced by the attenuated base and provided with a moderately strong fold opposite the umbilical chink.

The type has 5 post-nuclear whorls, and measures: length 3 mm., diameter 1.3 mm. It and another specimen (Cat. No. 196249, U.S.N.M.) were collected by Mr. S. S. Berry in 12 fathoms, off Del Monte, Monterey, California. Two additional specimens from the same station are in Mr. Berry's collection.

ODOSTOMIA (EVALEA) TENUISCULPTA Carpenter.

Plate XLVII, fig. 6.

Odostomia tenuisculpta CARPENTER, 2nd Rept. Brit. Assoc. Adv. Sci., 1864, p. 659; Ann. Mag. Nat. Hist., XV, 1865, p. 30.

Shell elongate-ovate, yellowish, with the early whorls spirally lirate and the later ones only obsoletely so. Nuclear whorls small, smooth, obliquely almost completely immersed in the first of the succeeding turns. Post-nuclear whorls evenly well-rounded with appressed summits. The first three marked between the sutures by many subequal liræ of which there are about 15 on the second turn. On the last two turns these lirations become quite obsolete. Periphery and base of the last whorl inflated and well-rounded, marked by very feeble spiral striation and lines of growth. Aperture moderately large, oval; somewhat effuse anteriorly; posterior angle acute; outer lip thin; columella strongly curved, reenforced partly by the attenuated base, moderately reflected anteriorly bearing a strong fold at its insertion which appears as if it were the inflected termination of the columella.

Doctor Carpenter's type (Cat. No. 15520, U.S.N.M.) is a young individual. It was collected by J. G. Swan at Neah Bay, Washington, has 3 post-nuclear whorls, and measures: length 2.3 mm., diameter 1.7 mm. The adult characters were described from two specimens (Cat. No. 46483, U.S.N.M.), collected by J. G. Swan at Neah Bay, Washington. One of these, the one figured, has 6 post-nuclear whorls and measures: length 5.3 mm., diameter 2.9 mm. A specimen collected by Merrihew (Cat. No. 196247, U.S.N.M.), at Port Harford, California, bears a slender raised cord on the periphery of the whorl.

The large series of specimens in the U. S. National Museum proves conclusively that *O. straminea* Carpenter is the smooth southern representative of the species.

The U. S. National Museum has the following material:

Specimens of Odostomia (Evalea) tenuisculpta Carpenter.

No. of specimens.	Locality.	Collector.	Catalogue No.
1	Neah Bay, Washington	J. G. Swan	15520 U.S.N.M.
2	do	do	46483 U.S.N.M.
75	Little River, Mendocino County, California	G. W. Harford	46486 U.S.N.M.
6	Gualala, Mendocino County, California	Stearns collection	101945 U.S.N.M.
2	San Francisco Bay, California	Doctor Hewston	74006 U.S.N.M.
30	Monterey, California	Stearns collection	46482 U.S.N.M.
30	do	do	46485 U.S.N.M.
30	do	do	46493 U.S.N.M.
21	do	do	46489 U.S.N.M.
2	do	do	46491 U.S.N.M.
4	do	P. P. Carpenter	46476 U.S.N.M.
1	do	W. H. Dall	159475 U.S.N.M.
17	do	do	159477 U.S.N.M.
5	do	do	159478 U.S.N.M.
13	do	do	159479 U.S.N.M.
1	do		159480 U.S.N.M.

ODOSTOMIA (EVALEA) PHANEA, new species.

Plate XLVIII, fig. 7.

Odostomia (*Evalea*) *gouldi* Dall and Bartsch, Mem. Cala. Acad., 1903, p. 282, pl. I, fig. 15, not *Odostomia* (? var.) *gouldii* Carpenter, Ann. Mag. Nat. Hist., 3d ser., XV, 1865, p. 30 (=*Odostomia* (*Amaura*) *gouldi* Carpenter, of the present paper).

Shell elongate-ovate, subdiaphanous to milk-white, stout and shining. Nuclear whorls small, deeply immersed in the first of the succeeding turns. Post-nuclear whorls rather high between the sutures, well rounded with scarcely an indication of a shoulder at the summit, separated by well-marked sutures. Periphery and the rather long base of the last whorl well rounded. The first two whorls are regularly closely spirally striated, in the third the striation becomes enfeebled and on the penultimate decidedly obsolete, while the base is smooth. About 18 of the striae are visible on the third turn. Aperture large, oval, somewhat effuse anteriorly; columella decidedly curved and reflected, reenforced by the attenuated base, provided with a strong oblique fold at its insertion.

The type has 5 post-nuclear whorls and measures: Length 4.8; diameter 2.6 mm. It and another specimen (Cat. No. 46408, U.S.N.M.) belong to the Stearns collection and come from Monterey, California.

There are 4 other lots in the collection of the U. S. National Museum, all from Monterey. Cat. No. 46496, one specimen belongs to the Stearns collection; Cat. Nos. 46474 and 46479, one specimen each collected by Doctor Canfield, and Cat. No. 159459, two collected by Doctor Dall.

Subgenus AMAURA Möller.

Amaura Möller, Index Moll. Groenlandica, 1842, p. 7.

Very large, usually inflated Odostomias, the sculpture of which consists of very fine lines of growth and still finer wavy closely placed spiral striations.

Type.—*Amaura candida* Möller.

KEY TO SPECIES OF AMAURA.

Shell umbilicated:
  Adult shell large, 10 mm. long .... *kennerleyi.*
  Adult shell medium size, 7 mm. or less long .... *satura.*
Shell not umbilicated:
  Whorls with the summit appressed—
    Shell shortly ovate .... *nuciformis.*
    Shell elongate-ovate .... *avellana.*
  Whorls with the summits shouldered—
    Adult shell more than 9 mm. long .... *montereyensis.*
    Adult shell less than 7 mm. long .... *gouldii.*

ODOSTOMIA (AMAURA) KENNERLEYI, new species.

Plate XLVIII, figs. 8, 8*a*.

Shell large, very thin, broadly conic, umbilicated, yellowish-white; marked by subobsolete, subequal, and subequally spaced spiral wrinkles, about 15 of which may be seen on the body and base of the last whorl. In addition to these wrinkles, many faint, closely-placed spiral and vertical striae are present. Nuclear whorls small, about 2½ forming a depressed spire which is deeply immersed, the axis of which is almost at right angles to the axis of the latter whorls. Post-nuclear whorls very wide, inflated, well rounded, faintly shouldered at the summit. Sutures well marked, simple. Periphery and base of the last whorl inflated, well rounded, the latter decidedly contracted and narrowly umbilicated. Aperture large, suboval, somewhat effuse anteriorly; posterior angle obtuse; outer lip thin; columella straight, obliquely inserted, revolute, not reenforced by the base, with an oblique weak fold near its insertion; parietal wall apparently without a callus.

The type (Cat. No. 150564, U.S.N.M.) was collected by Rev. G. W. Taylor at Nanaimo, British Columbia. It has 6 post-nuclear whorls which measure: Length 10.2 mm., diameter 6 mm.

Two other specimens (Cat. No. 4493*b*, U.S.N.M.) were collected by Doctor Kennerley at Puget Sound, Washington, and another (Cat. No. 129121) by Prof. O. B. Johnson, at Seattle, Washington.

ODOSTOMIA (AMAURA) SATURA Carpenter.

Plate XLVIII, figs. 5, 5*a*.

= *Odostomia satura* CARPENTER, Ann. Mag. Nat. Hist., 3d ser., XV, 1865, p. 29.
+ var. *pupiformis* CARPENTER, Ann. Mag. Nat. Hist., 3d ser., XV, 1865, p. 29.

Shell of medium size, broadly conic, white. Nuclear whorls at least two, forming a depressed spire, the axis of which is almost at a right angle to the axis of the later whorls, and which is deeply, somewhat obliquely immersed in the first post-nuclear turn. Post-nuclear whorls moderately well rounded, faintly shouldered at the summit, marked all over by irregular rough, low, tumescenses, which simulate obsolete vertical ribs. Sutures simple, well marked. Periphery of the last whorl well rounded. Base quite short, decidedly rounded, and umbilicated. Umbilicus partly covered by the revolute columella. Aperture large, very broadly oval, somewhat effuse anteriorly; posterior angle obtuse; outer lip thick; columella moderately strong, oblique, decidedly curved, with a decided oblique fold, situated considerably anterior to its insertion; parietal wall covered by a fairly thick callus.

The type (Cat. No. 15520, U.S.N.M.) was collected by J. G. Swan at Neah Bay, Washington. It has 5½ whorls which measure: Length 6.4 mm., diameter 3.5 mm.

The specimen upon which Doctor Carpenter fixed the name *pupiformis* (Cat. No. 15520*a*, U.S.N.M.) collected by J. G. Swan at Neah Bay, Washington, is not worthy of a varietal name. It is a freak, having the spire less elevated, which is, perhaps, due to some injury received at an early date, evidence of which seems present. It agrees perfectly in every detail with the type of *satura* excepting the shape of the spire.

ODOSTOMIA (AMAURA) NUCIFORMIS Carpenter.

Plate XLVIII, figs. 3, 3*a*.

Odostomia nuciformis CARPENTER, Ann. Mag. Nat. Hist., 3d ser., XV, 1865, p. 30.

Shell large, shortly ovate, yellowish to milk-white. Nuclear whorls deeply immersed; only half of the last turn is seen in tilted position when viewed from above. Post-nuclear whorls increasing rapidly in size, well rounded, having their summits closely appressed to the preceding whorl. Sutures moderately well impressed. Periphery and base of the last whorl well rounded. Aperture rather large, ovate, white within; posterior angle acute; outer lip moderately thin at the edge, thicker within; columella short, strongly curved, with a strong oblique fold at its insertion; reenforced by the attenuated base; parietal wall covered by a weak callus.

The type (Cat. No. 15517*a*, U.S.N.M.) comes from Neah Bay, Washington. It has 5 post-nuclear whorls which measure: Length 7.7 mm., diameter 4.4 mm.

Odostomia (*Amaura*) *nuciformis* Carpenter differs from its subspecies in having the spire more depressed than either of them. It is a short, stubby inflated, ovoid shell, having the summit of the whorls closely appressed.

ODOSTOMIA (AMAURA) NUCIFORMIS AVELLANA Carpenter.

Plate XLVIII, figs. 1, 1*a*.

Odostomia (? var.) *avellana* CARPENTER, Ann. Mag. Nat. Hist., 3d ser., XV, 1865, p. 30.

Shell large, elongate-ovate, yellowish to milk-white. Nuclear whorls deeply vertically immersed; only part of the last volution is visible when viewed from above, their axis evidently being at a right angle to the axis of the later whorls. Post-nuclear whorls increasing rapidly in size, early ones well rounded, later ones less so, their summits being closely appressed to the preceding whorl. Sutures well impressed, simple. Periphery and base of the last whorl well rounded, the latter somewhat elongated. Aperture large, ovate, somewhat effuse anteriorly, milk-white within; posterior angle acute; outer lip thin at the edge, thick within; columella short curved, reenforced partly by the attenuated base, having a strong oblique fold at its insertion; parietal wall covered by a moderately strong callus.

The type (Cat. No. 15517*b*, U.S.N.M.) comes from Neah Bay, Washington. It has 5 post-nuclear whorls and measures: Length 8.3 mm., diameter 4.3 mm.

The present subspecies differs from *O.* (*A.*) *nuciformis* Carpenter chiefly in having the spire much more elongated.

ODOSTOMIA (AMAURA) MONTEREYENSIS, new species.

Plate XLVIII, figs. 6, 6*a*.

Shell large, similar in form to *O.* (*A.*) *n. avellana;* white, shining. Nuclear whorls 3, helicoid, quite elevated, deeply immersed in the first of the succeeding whorls, having their axis at a right angle to the axis of the later whorls. Post-nuclear whorls well rounded, with a beveled shoulder at the summits. Sutures well marked, simple. Periphery and base of the last whorl well rounded and inflated, the latter somewhat elongated. Aperture subovate, somewhat effuse anteriorly; posterior angle acute; outer lip thin at the edge, thick within; columella curved and somewhat revolute, having a prominent oblique fold near its insertion; parietal wall covered by a thin callus.

The type (Cat. No. 46473, U.S.N.M.) is from Monterey, California. It has 6 post-nuclear whorls which measure: Length 9.6 mm., diameter 5.1 mm.

In addition to these others have been named for the University of California from Monterey; for Mr. S. S. Berry from 12 fathoms off Del Monte, Monterey Bay; for Mrs. Oldroyd from San Pedro, and for Mr. Kelsey from San Diego, California.

This species resembles *O.* (*A.*) *n. avellana* Carpenter, but differs markedly from that form by having the summits of the whorls shouldered.

ODOSTOMIA (AMAURA) GOULDII Carpenter.

Plate XLVIII, fig. 4.

Odostomia (? var.) *gouldii* CARPENTER, Ann. Mag. Nat. Hist., 3d ser., XV, 1865, p. 29.

Shell of medium size, elongate-conic, yellowish-white, the exterior surface marked by irregular tumescences, giving it a much worn appearance. Nuclear whorls three, deeply immersed, having their axis at about a right angle to the axis of the succeeding turns. Post-nuclear whorls moderately well rounded, faintly shouldered at the summit. Sutures simple, well marked. Periphery and base of the last whorl well rounded, the latter somewhat elongated. Umbilicus faint. Aperture quite large, pyriform, posterior angle obtuse, outer lip moderately thick; columella very oblique, fairly strong, revolute, with a strong fold somewhat anterior to its insertion; parietal wall covered with a fairly strong callus.

The type (Cat. No. 22821, U.S.N.M.) comes from Neah Bay, Washington. It has 6 post-nuclear whorls and measures: Length 6.1 mm., diameter 3.1 mm.

EXPLANATION OF PLATES.

In some instances the very fine, closely crowded striation has been omitted, while in other cases where shown it has been exaggerated by the artist. Attention is called to this under the explanation of the figures. The measurements cited after the names refer to the axial length of the specimen.

Plate XLIV.

Fig. 1. *Turbonilla* (*Strioturbonilla*) *vancouverensis* Baird; 6.2 mm.; p. 495. The fine spiral markings have been omitted in this figure.
2. *Turbonilla* (*Chemnitzia*) *muricatoides*, new species; type; 3 mm.; p. 495. The fine spiral markings have been omitted in this figure.
2*a*. Nucleus of same, lateral view, much enlarged.
3. *Turbonilla* (*Pyrgolampros*) *valdezi*, new species; type; 5.6 mm.; p. 502. The fine spiral markings have been omitted in this figure.
3*a*. Nucleus of same, seen from above, much enlarged.
4. *Turbonilla* (*Pyrgolampros*) *lyalli*, new species; type; 5.7 mm.; p. 500. The fine spiral markings have been omitted in this figure.
4*a*. Nucleus of same, lateral view, much enlarged.
5. *Turbonilla* (*Turbonilla*) *gilli*, new species; type; 3.6 mm.; p. 493.
6. *Turbonilla* (*Pyrgolampros*) *victoriana*, new species; type; 7 mm.; p. 501. The fine spiral markings have been omitted in this figure.
7. *Turbonilla* (*Turbonilla*) *gilli delmontensis*, new subspecies; type; 3.4 mm ; p. 494.
8. *Turbonilla* (*Strioturbonilla*) *serræ*, new species; type; 7.7 mm.; p. 497. The fine spiral markings have been omitted in this figure.
8*a*. Nucleus of same, lateral view, much enlarged.
9. *Turbonilla* (*Pyrgolampros*) *taylori*, new species; type; 11.5 mm.; p. 499. The fine spiral markings have been omitted in this figure.
9*a*. Nucleus of same, lateral view, much enlarged.
10. *Turbonilla* (*Pyrgolampros*) *berryi*, new species; type; 8 mm.; p. 500.
10*a*. Nucleus of same, lateral view, much enlarged.
11. *Turbonilla* (*Strioturbonilla*) *stylina* Carpenter; 6.5 mm.; p. 497. The fine spiral markings have been omitted in this figure.
11*a*. Nucleus of same, lateral view, much enlarged.

Plate XLV.

Fig. 1. *Turbonilla* (*Pyrgiscus*) *morchi*, new species; type, 6.4 mm.; p. 505.
1*a*. Nucleus of same, lateral view, much enlarged.
2. *Turbonilla* (*Pyrgolampros*) *oregonensis*, new species; type; 8.5 mm.; p. 503. The fine spiral markings have been omitted in this figure.
3. *Turbonilla* (*Pyrgiscus*) *tenuicula* Gould; 6.1 mm.; p. 508.
3*a*. Nucleus of same, lateral view, much enlarged.
4. *Turbonilla* (*Pyrgiscus*) *antestriata*, new species; type; 9.7 mm.; p. 506.
4*a*. Nucleus of same, lateral view, much enlarged.
5. *Turbonilla* (*Pyrgolampros*) *aurantia* Carpenter; type; 6.2 mm.; p. 502. The spiral markings have been exaggerated in this figure.
6. *Turbonilla* (*Pyrgolampros*) *newcombei*, new species; type; 5.4 mm.; p. 503.
7. *Turbonilla* (*Mormula*) *lordi* Smith; 21 mm.; p. 510.
7*a*. Nucleus of same, lateral view, much enlarged.
8. *Turbonilla* (*Pyrgiscus*) *eucosmobasis*, new species; type; 11.2 mm.; p. 507.
8*a*. Nucleus of same, lateral view, much enlarged.
9. *Turbonilla* (*Mormula*) *tridentata* Carpenter; 12.8 mm.; p. 511.
10. *Turbonilla* (*Mormula*) *eschscholtzi*, new species; type; 13.3 mm.; p. 513.

PLATE XLVI.

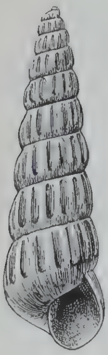
FIG. 1. *Odostomia* (*Chrysallida*) *astricta*, new species; type; 2.9 mm.; p. 515.
2. *Odostomia* (*Ividia*) *navisa*, new species; type; 2.9 mm.; p. 517.
2*a*. Nucleus of same, lateral view, much enlarged.
3. *Odostomia* (*Ividia*) *navisa delmontensis*, new subspecies; type; 3.2 mm.; p. 518.
3*a*. Nucleus of same, lateral view, much enlarged.
4. *Odostomia* (*Chrysallida*) *montereyensis*, new species; type; 3 mm.; p. 516.
5. *Odostomia* (*Menestho*) *harfordensis*, new species; type; 3.2 mm.; p. 521.
6. *Odostomia* (*Menestho*) *exara*, new species; type; 3.9 mm.; p. 521.
7. *Odostomia* (*Chrysallida*) *cooperi*, new species; type; 3.1 mm.; p. 514.
8. *Odostomia* (*Menestho*) *pharcida*, new name; type; 2.2 mm.; p. 520.
9. *Odostomia* (*Iolaea*) *amianta*, new species; type; 4.5 mm.; p. 519.
9*a*. Nucleus of same, seen from above, much enlarged.
10. *Odostomia* (*Chrysallida*) *oregonensis*, new species; type; 3.3 mm.; p. 516.
10*a*. Nucleus of same, lateral view, much enlarged.

PLATE XLVII.

FIG. 1. *Odostomia* (*Evalea*) *tillamookensis*, new species; type; 4.1 mm.; p. 522. The spiral sculpture is somewhat exaggerated in this figure.
2. *Odostomia* (*Evalea*) *angularis*, new species; type; 5.6 mm.; p. 523. The spiral sculpture is somewhat exaggerated in this figure.
3. *Odostomia* (*Evalea*) *jewetti*, new species; type; 6.1 mm.; p. 523. The spiral sculpture is somewhat exaggerated in this figure.
4. *Turbonilla* (*Pyrgiscus*) *canfieldi*, new species; type; 6.3 mm.; p. 504.
4*a*. Nucleus of same, lateral view, much enlarged.
5. *Odostomia* (*Evalea*) *deliciosa*, new species; type; 4 mm.; p. 525. The fine spiral markings have been omitted in this figure.
6. *Odostomia* (*Evalea*) *tenuisculpta* Carpenter; 5.3 mm.; p. 527. The fine spiral markings have been omitted in this figure.
7. *Turbonilla* (*Pyrgiscus*) *castanea*, new species; type; 13.5 mm.; p. 509.
8. *Odostomia* (*Evalea*) *inflata* Carpenter; type; 6.2 mm.; p. 524. The fine spiral sculpture has been somewhat exaggerated in this figure.
9. *Odostomia* (*Evalea*) *columbiana*, new species; type; 8.3 mm.; p. 525. The fine spiral sculpture has been somewhat exaggerated in this figure.
10. *Odostomia* (*Evalea*) *tacomaënsis*, new species; type; 4.3 mm.; p. 526. The fine spiral sculpture has been somewhat exaggerated in this figure.

PLATE XLVIII.

FIG. 1. *Odostomia* (*Amaura*) *nuciformis avellana* Carpenter; type; 9.1 mm.; p. 530.
1*a*. Nucleus of same, seen from above, much enlarged.
2. *Odostomia* (*Evalea*) *valdezi*, new species; type; 3 mm.; p. 526. The fine spiral sculpture has been omitted in this figure.
3. *Odostomia* (*Amaura*) *nuciformis* Carpenter; type; 7.7 mm.; p. 530.
3*a*. Nucleus of same, seen from above, much enlarged.
4. *Odostomia* (*Amaura*) *gouldii* Carpenter; type; 6.1 mm.; p. 531.
5. *Odostomia* (*Amaura*) *satura* Carpenter; type; 6.5 mm.; p. 529.
5*a*. Nucleus of same, seen from above, much enlarged.
6. *Odostomia* (*Amaura*) *montereyensis*, new species; type; 9.6 mm.; p. 531. The fine spiral sculpture is somewhat exaggerated in this figure.
6*a*. Nucleus of same, seen from above, much enlarged.
7. *Odostomia* (*Evalea*) *phanea*, new species; type; 4.8 mm.; p. 528.
8. *Odostomia* (*Amaura*) *kennerleyi*, new species; type; 10.2 mm.; p. 529.
8*a*. Nucleus of same, seen from above, much enlarged.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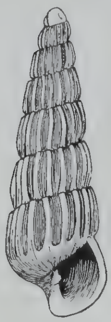
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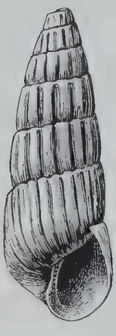
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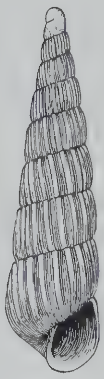
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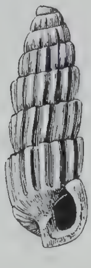
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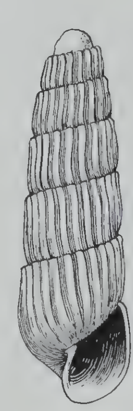
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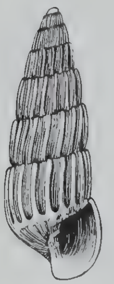
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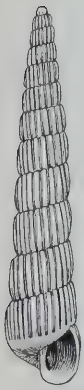
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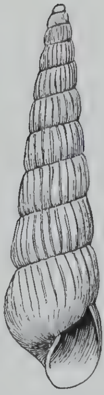
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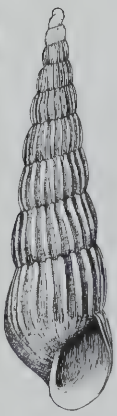
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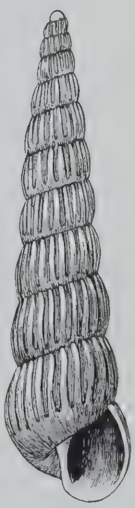
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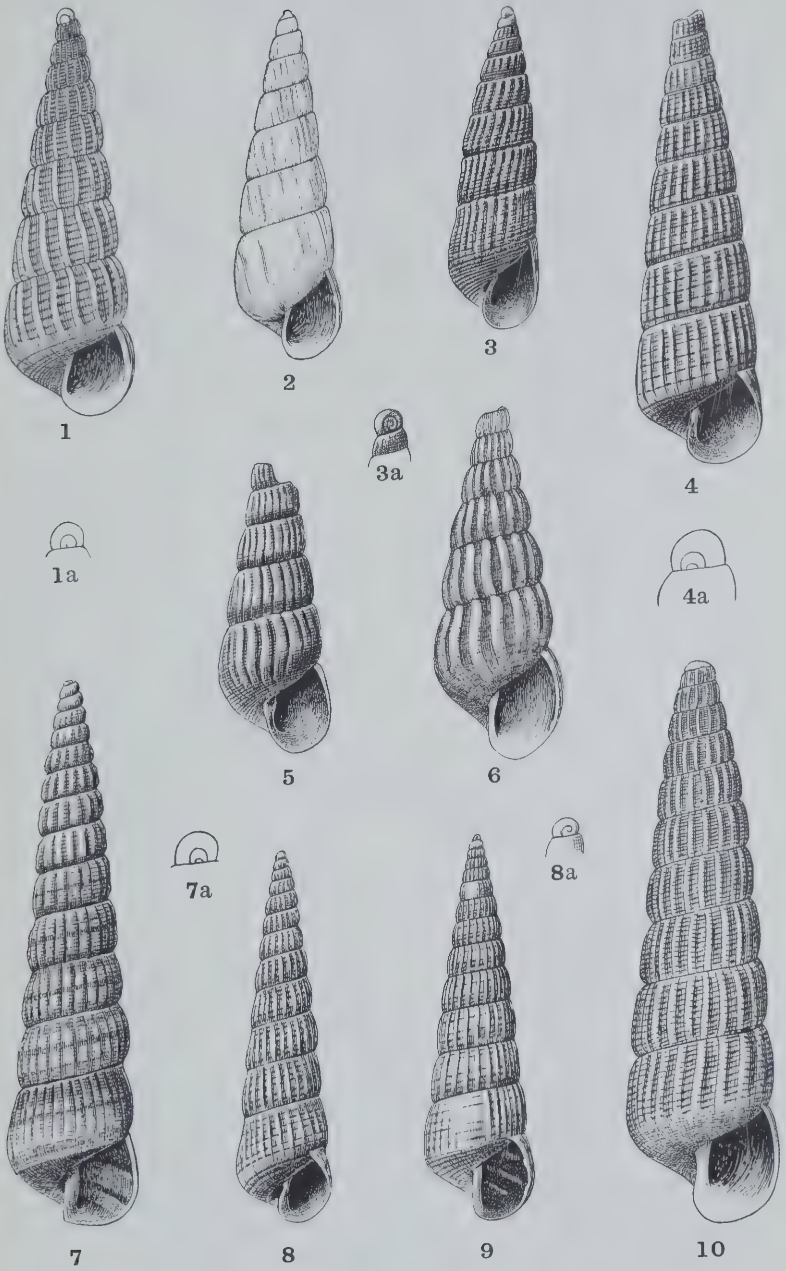
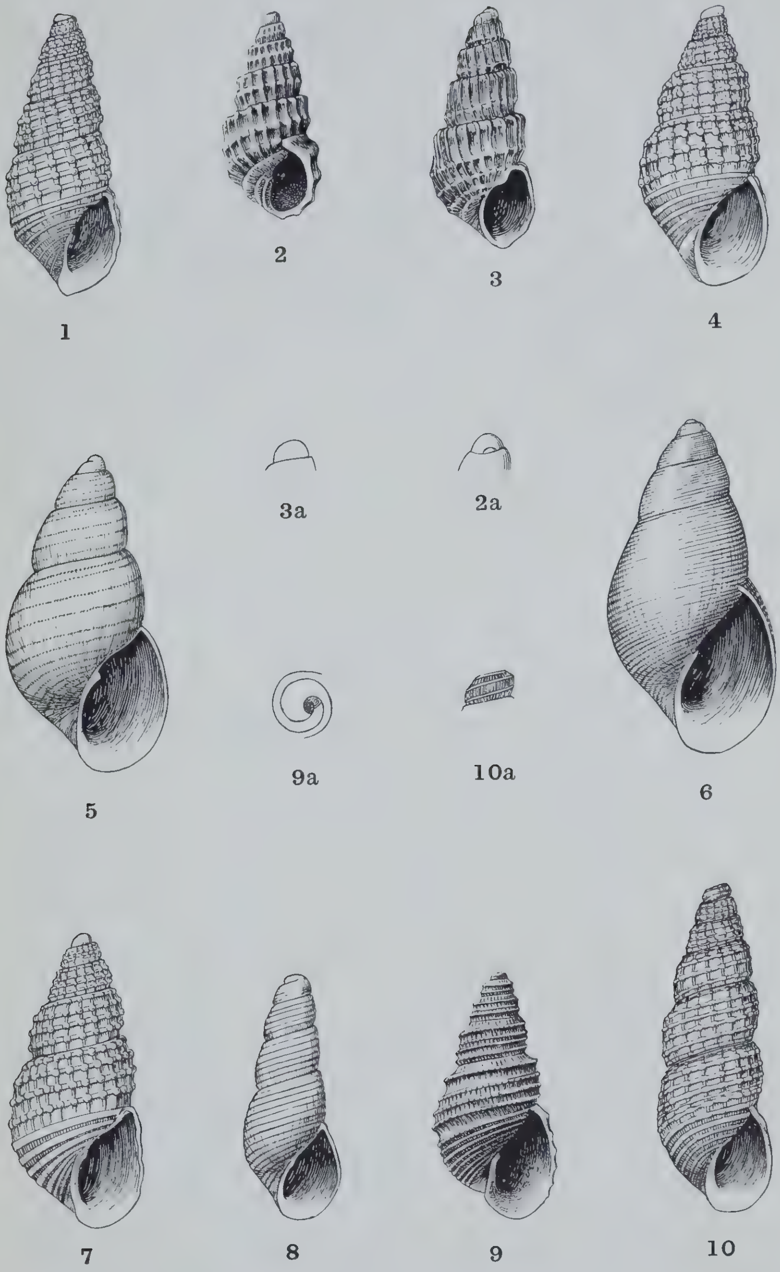
West American Turbonilla.

For explanation of plate see page 533.



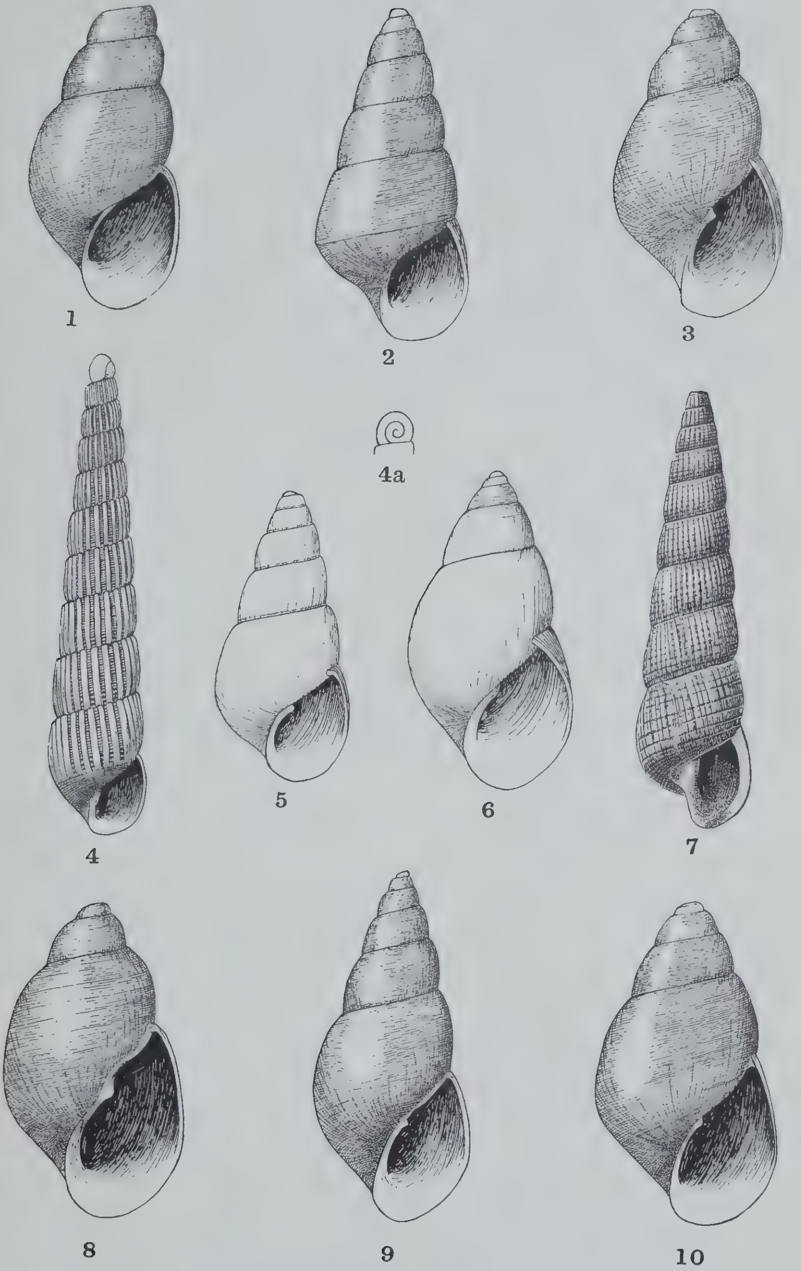
West American Turbonilla.

For explanation of plate see page 533.



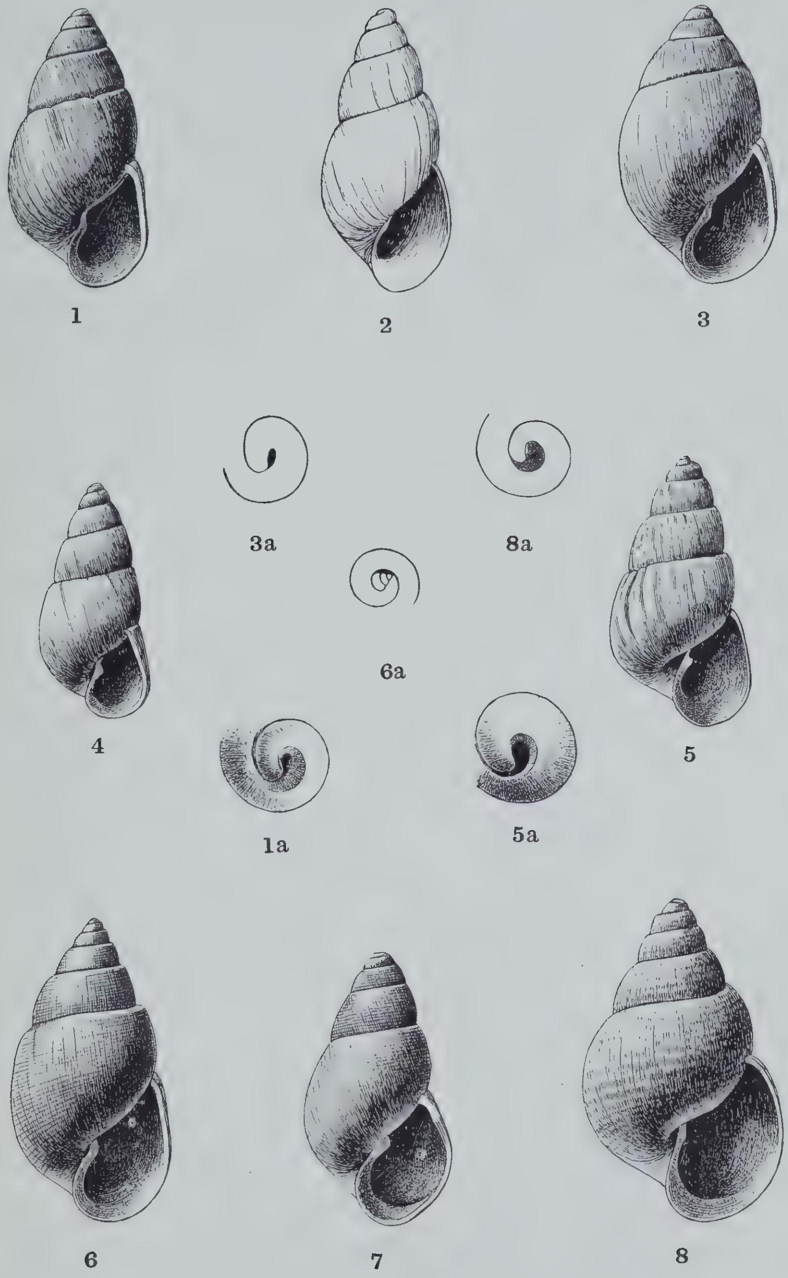
WEST AMERICAN ODOSTOMIA.

FOR EXPLANATION OF PLATE SEE PAGE 534.



West American Pyramidellidæ.

For explanation of plate see page 534.



West American Odostomia.

For explanation of plate see page 534.

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(From the 27th Annual Report of the Department of Geology and Natural Resources of Indiana, 1902.)

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A Check List of Indiana Mollusca

WITH LOCALITIES.

By L. E. DANIELS.

INDIANAPOLIS:
WM. B. BURFORD, CONTRACTOR FOR STATE PRINTING AND BINDING.
1903.

With respects of the Author

A CHECK LIST OF INDIANA MOLLUSCA, WITH LOCALITIES.

By L. E. Daniels.

The following is a list of the Mollusca with localities which were known to occur in Indiana on January 1, 1903, 276 species in all. The nomenclature of the land shells is that of Pilsbry's catalogue, mentioned in the introduction to the preceding paper. That of the Unionidæ is Simpson's "Synopsis of the Naiades, or Pearly Fresh Water Mussels," published in Vol. XXII of the Proceedings of the U. S. National Museum. Where the name used in Call's "Catalogue of the Mollusca of Indiana" differs from that of the present list, Call's name follows in italics and in parenthesis. Representatives of all but a half dozen of the species are in the State Museum.

Family HELICIDÆ.

Sub-family HELICINÆ.

1. Vallonia pulchella (Mull.).

Indianapolis, Mitchell and Arlington; common in southeastern Indiana.

2. Vallonia costata (Mull.).

Arlington, Marshall County.

Sub-family POLYGYRINÆ.

3. Polygyra leporina (Gld.).

New Harmony, Posey County; North Vernon, Jennings County; Dunreith, Henry County (Pleas.); Gibson County (Stein).

4. Polygyra plicata Say.

Clarksville, Floyd County.

5. Polygyra tridentata (Say). (*Triodopsis tridentata* Say).

Found all over the State.

6. POLYGYRA FRAUDULENTA Pils. (*Triodopsis fallax* Say).
   Not *Polygyra fallax* (Say), which is an eastern species, according to Pilsbry.
   Mt. Vernon, Lafayette, Laporte and Indianapolis.

7. POLYGYRA INFLECTA Say. (*Triodopsis inflecta* Say).
   Abundant in nearly all parts of the State.

8. POLYGYRA PROFUNDA (Say). (*Mesodon profundus* Say).
   Indianapolis, Corydon, Lawrenceburg, Brookville, Lower Wabash Valley.

9. POLYGYRA ALBOLABRIS (Say.) (*Mesodon albolabris* Say).
   All over the State.

10. POLYGYRA EXOLETA (Binn). (*Mesodon exoletus* Binn.)
    Common over the southern two-thirds of the State.

11. POLYGYRA MULTILINEATA (Say). (*Mesodon multilineatus* Say).
    All over the State in suitable localities.

12. POLYGYRA PALLIATA (Say). (*Triodopsis palliata* Say).
    All over the State.

13. POLYGYRA OBSTRICTA (Say). (*Triodopsis obstricta* Say).
    Grand Chain and New Harmony, Posey County.

14. POLYGYRA APPRESSA (Say). (*Triodopsis appressa* Say).
    New Harmony, Mt. Vernon, Lawrenceburg, Cannelton and Wyandotte.

15. POLYGYRA ELEVATA (Say). (*Mesodon elevatus* Say).
    All over the State.

16. POLYGYRA PENNSYLVANICA (Green). (*Mesodon pennsylvanicus* Green).
    Brookville, Lafayette and Brookston.

17. POLYGYRA THYROIDES (Say). (*Mesodon thyroideus* Say).
    All over the State.

18. POLYGYRA CLAUSA (Say). (*Mesodon clausus* Say).
    Brookville, Lafayette, De Long. Over nearly all of the State.

19. POLYGYRA MITCHELLIANA (Lea). (*Mesodon mitchellianus* Lea).
    Brookville.

20. POLYGYRA STENOTREMA (Fer.). (*Stenotrema stenotremum* Fer.).
    Madison, Lawrenceburg; common at Wyandotte.

21. **Polygyra hirsuta** (Say). (*Stenotrema hirsutum* Say).

All over the State.

22. **Polygyra monodon** (Fack.). (*Stenotrema leaii* Ward).

Arlington, Marshall County; Pine and Hammond, Lake County; Rochester; near the lakes in Kosciusko and Steuben counties.

22a. **P. monodon fraterna** (Say). (*Stenotrema monodon* Rack.).

All over the State.

Family PUPIDÆ.

23. **Strobilops labyrinthica** (Say). (*Strobila labyrinthica* Say).

Brookville, North Vernon, Princeton, Huntingburg, Cannelton; New Harmony, Posey County; cypress swamps, Knox County.

24. **Strobilops virgo** (Pils.).

Cannelton, New Harmony, Arlington, Princeton and Wyandotte.

25. **Strobilops affinis** Pils.

Lawrenceburg, Mitchell, Wyandotte; New Harmony, Posey County; Cannelton, Perry County; Huntingburg; near Lake James, Steuben County, and Tippecanoe Lake, Kosciusko County.

26. **Pupoides marginatus** (Say). (*Leucochila fallax* Say).

Brookville, North Vernon, Mitchell, New Harmony, Arlington and Pine. Dunreith (Pleas).

27. **Bifidaria armifera** Say. (*Leucochila armifera Say*).

Brookville, Lawrenceburg, Mitchell, New Harmony, Arlington, Seymour and Indianapolis.

28. **Bifidaria contracta** Say. (*Leucochila contracta* Say).

Vawter Park, Arlington, Brookville, Huntingburg, Indianapolis, North Vernon, Seymour, Mitchell and New Harmony.

29. **Bifidaria procera** Gld.

Mitchell, Connersville (Walker).

30. **Bifdaria corticaria** (Say). (*Leucochila corticaria* Say).

Grand Chain, New Harmony; Morgan County. Dunreith (Pleas).

31. Bifidaria holzingeri Sterki.

Dunreith (Sterki).

32. Bifidaria curvidens Gld.

Wolf Lake, Lake County (Baker); Henry County and Connersville (Sterki). Dunreith (Pleas).

33. Bifidaria pentodon Say. (*Pupilla pentodon* Say).

Tippecanoe and Turkey lakes, Kosciusko County, New Harmony, Mitchell, Arlington, Seymour. Dunreith (Pleas).

34. Vertigo milium Gld.

Lake James, Steuben County; Vawter Park, Brookville and Lawrenceburg (Call). Dunreith (Pleas).

35. Vertigo ovata Say.

Tippecanoe Lake, Kosciusko County; Lake James, Steuben County; Arlington. Dunreith (Pleas). Lawrenceburg and Indianapolis (Call).

36. Vertigo morsei Sterki.

Near Tippecanoe Lake, Kosciusko County; Lake Maxinkuckee, Marshall County, and Lake James, Steuben County.

37. Vertigo gouldi Binn.

Henry County and Connersville (Sterki); Dunreith (Pleas).

38. Vertigo tridentata Wolf.

Danville (Walker); Dunreith (Pleas).

Family ACHATINIDÆ.

39. Cochlicopa lubrica (Mull.). (*Ferussacia subcylindrica* Linn.).

New Harmony, Indianapolis, Wolf Lake, Lake County (Baker); northern half of the State (Call).

Family CIRCINARIIDÆ Pilsbry.

40. Circinaria concava (Say). (*Macrocyclis concava* Say).

All over the State.

Family ZONITIDÆ.

Sub-family ZONITINÆ Pilsbry.

41. Omphalina fuliginosa (Griff.). (*Zonites fuliginosus* Griff.).
Grand Chain, Posey County; Mitchell and Wyandotte; Dunreith (Pleas); Corydon, Madison and Bloomington (Call).

42. Omphalina friabilis (W. G. B.). (*Zonites friabilis* W. G. B.).
Cypress swamps, Knox County.

43. Omphalina lævigata (Pfr.).
Grand Chain and Mt. Vernon, Posey County; Cannelton and Laurel.

44. Omphalina inornata (Say). (*Zonites inornatus* Say).
Laurel, Corydon, Madison and Lawrenceburg (Call).

45. Vitrea cellaria (Mull.)
Laporte (in greenhouse).

46. Vitrea hammonis (Strom.).
Laurel, Indianapolis, Arlington, De Long, Vawter Park; Lake James, Steuben County, and cypress swamps, Knox County.

47. Vitrea wheatleyi (Bland).
New Harmony, Brookville, Huntingburg and Indianapolis.

48. Vitrea indentata Say.
Cannelton, New Harmony, Mitchell, Indianapolis, Arlington, Brookville, North Vernon, Wyandotte, Seymour, Millers, Lawrenceburg and cypress swamps, Knox County.

49. Vitrea capsella (Gld.).
New Harmony, Posey County; and Huntingburg, Dubois County.

50. Euconulus fulvus (Mull.). (*Zonites fulvus* Drap.).
Arlington, Brookville, North Webster; Lake James, Steuben County, and Tippecanoe Lake, Kosciusko County.

51. Euconulus chersinus Say.
New Harmony, North Vernon, Huntingburg; Pine, Lake County; Morgan County, and cypress swamps, Knox County.

Sub-family ARIOPHANTINÆ Pilsbry.

52. Zonitoides nitidus (Mull.).

Vawter Park, Tippecanoe Lake and North Webster, Kosciusko County; Arlington and De Long, Marshall County; Lake James, Steuben County.

53. Zonitoides arboreus (Say). (*Zonites arboreus* Say).

All over the State.

54. Zonitoides limatulus (Ward). (*Zonites limatulus* Ward).

Seymour and Indianapolis. Wabash and Terre Haute (Call).

55. Zonitoides minusculus (Binn.).

Wolf Lake, Lake County (Baker); Mitchell, Huntingburg, Grand Chain, Seymour and Vawter Park.

56. Zonitoides lævisculus (Sterki).

Dunreith, Henry County.

57. Zonitoides milium (Morse).

Princeton, Gibson County.

58. Gastrodonta intertexta (Binn.). (*Zonites intertextus* Binn.).

Grand Chain and Mt. Vernon, Posey County; Mitchell, Wyandotte; southeastern Indiana (Call).

59. Gastrodonta demissa (Binn.).

Wolf Lake, Lake County (Baker).

60. Gastrodonta ligera (Say). (*Zonites ligerus* Say).

Grand Chain and New Harmony, Posey County.

61. Gastrodonta interna (Say). (*Zonites internus* Say).

Cannelton and Wyandotte.

Family LIMACIDÆ.

62. Limax flavus L.

Lawrenceburg (Call).

63. Agriolimax agrestis (L.).

Laporte County.

64. Agriolimax campestris (Binn.).

Common.

Family PHILOMYCIDÆ.

65. **Philomycus carolinensis** (Bosc.). (*Tebennophorus carolinensis* Bosc.).
Over nearly all the State.

Family ENDODONTIDÆ.

66. **Pyramidula alternata** (Say). (*Patula alternata* Say).
All over the State.

67. **Pyramidula solitaria** (Say). (*Patula solitaria* Say).
Lafayette, Laporte, Terre Haute, New Harmony, Mt. Vernon, Lawrenceburg, North Vernon, Vawter Park.

68. **Pyramidula perspectiva** (Say). (*Patula perspectiva* Say).
All over the State.

69. **Pyramidula striatella** (Anth.). (*Patula striatella* Anth.).
Indianapolis, Brookville, Lawrenceburg, Corydon, Lafayette.

70. **Helicodiscus lineatus** (Say).
Seymour, Huntingburg, North Vernon, New Harmony, Vawter Park, Lafayette and Indianapolis.

Sub-family PUNCTINÆ.

71. **Punctum pygmæum** (Drap.).
Seymour, Jackson County, and Vawter Park, Kosciusko County.

72. **Sphyradium edentulum** (Drap.).
Near Clear Lake, Steuben County, and Vawter Park, Kosciusko County.

Family SUCCINIDÆ.

73. **Succinea retusa** Lea. (*Succinea ovalis* Gld.).
Kosciusko, Marshall, Laporte, Steuben and Lake counties.

74. **Succinea calumetensis** Calkins.
Half Moon Pond, Posey County, and cypress swamps, Knox County.

75. **Succinea ovalis** Say. (*Succinea obliqua* Say).
Arlington and De Long, Fulton County.

76. **Succinea avara** Say.
Kosciusko, Laporte and Whitley counties.

Family AURICULIDÆ.

77. CARYCHIUM EXIGUUM Say.

Tippecanoe Lake and Vawter Park, Kosciusko County; Lawrenceburg, New Albany and Indianapolis (Call).

78. CARYCHIUM EXILE H. C. Lea.

Vawter Park, Kosciusko County; Berry Lake, Lake County (Baker).

Family LIMNÆIDÆ.

Sub-family LIMNÆINÆ.

79. LIMNÆA STAGNALIS APPRESSA Say.

Turkey Lake, Kosciusko County; Lake Michigan, Millers; Kankakee River, Laporte County.

80. LIMNÆA REFLEXA Say. (*Limnophysa reflexa* Say).

Hammond, Millers, near Lake Michigan; Kankakee River, Laporte County. Common in northern Indiana.

80a. L. REFLEXA KIRTLANDIANA Lea.

Roby, Lake County.

81. LIMNÆA PALUSTRIS Mull. (*Limnophysa palustris* Mull.).

Turkey and Tippecanoe lakes, Kosciusko County; Carr's Slough, White County, and cypress swamps, Knox County.

81a. L. PALUSTRIS MICHIGANENSIS Walker.

Tippecanoe and Turkey lakes, Kosciusko County; Calumet Lake, Lake County (Baker).

82. LIMNÆA CAPERATA Say. (*Limnophysa caperata* Say).

Hammond, North Vernon, Calumet Lake and Roby (Baker).

82a. L. CAPERATA UMBILICATA Adams.

Liverpool, Lake County (Baker).

83. LIMNÆA CATASCOPIUM Say.

Calumet Lake, Lake County (Baker).

84. LIMNÆA COLUMELLA Say.

Bass Lake, Starke County; Grassy Creek, Kosciusko County.

85. LIMNÆA WOODRUFFI Baker.

Lake Michigan at Pine, Millers and Michigan City.

86. LIMNÆA HUMILIS Say. (*Limnophysa humilis* Say).

Turkey and Tippecanoe lakes, Kosciusko County; Bass Lake, Starke County; Round Lake, Whitley County, and Lake Maxinkuckee, Marshall County.

87. LIMNÆA DESIDIOSA Say. (*Limnophysa desidiosa* Say).

Grassy Creek, Kosciusko County. All over the State (Call).

Sub-family PLANORBINÆ.

88. PLANORBIS TRIVOLVIS Say. (*Helisoma trivolvis* Say).

All over the State.

89. PLANORBIS TRUNCATUS Miles.

George Lake, Lake County (T. Jenson).

90. PLANORBIS BICARINATUS Say. (*Helisoma bicarinata* Say).

Lake Michigan, Michigan City; Lake James, Steuben County; Bass Lake, Starke County; Clear Lake, Laporte County.

91. PLANORBIS CAMPANULATUS Say. (*Planorbella campanulata* Say).

Common over the northern part of the State.

92. PLANORBIS EXACUTUS Say. (*Menetus exacutus* Say).

Bass Lake, Starke County; Turkey Lake and Grassy Creek, Kosciusko County; Cedar Lake, Lake County; Lawrenceburg and Ft. Wayne (Call).

93. PLANORBIS PARVUS Say. (*Gyraulus parvus* Say).

Bass Lake, Starke County; Lake Maxinkuckee, Marshall County; Cedar Lake, Lake County; Lake James, Steuben County; Grassy Creek, Kosciusko County, and Pine Lake, Lake County.

93a. P. PARVUS CIRCUMSTRIATUS Tyron.

Lake Maxinkuckee, Marshall County.

94. PLANORBIS HIRSUTUS Gld.

Grassy Creek, Tippecanoe Lake and Turkey Lake, Kosciusko County; Cedar Lake, Lake County; Bass Lake, Starke County.

95. PLANORBIS DEFLECTUS Say. (*Gyraulus deflectus* Say).

Grassy Creek, Kosciusko County.

96. PLANORBIS UMBILICATELLUS Cockerell.

Tippecanoe Lake, Kosciusko County.

97. SEGMENTINA ARMIGERA Say.

Carr's Slough, White County; cypress swamps, Knox County; Turkey and Tippecanoe lakes, Kosciusko County; Lake Maxinkuckee, Marshall County; Lake James, Steuben County.

Family ANCYLIDÆ.

98. ANCYLUS RIVULARIS Say.

Bass Lake, Starke County; Liverpool, Lake County (Baker).

99. ANCYLUS PARALLELUS Hald.

Bass Lake, Starke County.

100. ANCYLUS SHIMEKII Pils.

Bass Lake, Starke County.

101. ANCYLUS FUSCUS Adams.

Grassy Creek, Kosciusko County.

102. ANCYLUS DIAPHANUS Hald.

In State Museum, marked Indiana.

103. ANCYLUS TARDUS Say.

Grassy Creek, Kosciusko County; Ohio River, Lawrenceburg; Wabash and Maumee rivers (Call).

Family PHYSIDÆ.

104. PHYSA HETEROSTROPHA Say.

New Harmony, Posey County; Tippecanoe and Turkey lakes, Kosciusko County.

105. PHYSA ANCILLARIA Say.

Logansport; Collection Indiana State University from Turkey Lake, Kosciusko County (Call).

106. PHYSA SAYI Toppan.

Turkey and Tippecanoe lakes, Kosciusko County.

107. PHYSA RHOMBOIDEA Crandall.

Cypress swamps, Knox County.

108. PHYSA GYRINA Say.

New Harmony, Wyandotte, Indianapolis, cypress swamps, Knox County.

109. P. GYRINA ELLIPTICA Lea.

Cypress swamps, Knox County.

110. PHYSA INTEGRA Hald.

Wyandotte; Lake Michigan at Michigan City.

111. APLEXA HYPNORUM Linn. (*Bulinus hypnorum* Linn.).

Tippecanoe Lake and Vawter Park, Kosciusko County; Hammond, Lake County; Brookston, White County.

Family PLEUROCERIDÆ.

112. LITHASIA OBOVATA Say.

Falls of the Ohio River; Lawrenceburg (Call).

112a. L. OBOVATA BICONICA Pilsbry.

Wabash River, Gibson County.

113. ANGITREMA ARMIGERA Say.

Wabash River, Grand Chain, Posey County; Knox County. Common.

114. ANGITREMA VERRUCOSA Raf.

Wabash River, New Harmony, common; Ohio River, Lawrenceburg (A. C. Billups).

115. PLEUROCERA UNDULATUM Say.

Wabash River, Gibson and Posey counties. Common.

116. PLEUROCERA MONILIFERUM Lea.

Wabash River, Gibson County.

117. PLEUROCERA CANALICULATUM Say.

Wabash River, Gibson and Posey counties; Ohio River, New Albany.

118. PLEUROCERA SUBULARE Lea.

Manitou Lake, Rochester; Tippecanoe Lake, Kosciusko County; Wabash River, Terre Haute; Eel River, North Manchester.

119. PLEUROCERA ELEVATUM Say.

Ohio River at "The Falls" and Lawrenceburg.

120. PLEUROCERA ALVEARE Conrad.

Wabash River, Gibson County.

121. Goniobasis cubicoides Anthony.

Blue River, Wyandotte; Big Indian Creek, Corydon; Wabash River, Huntington (Call).

122. Goniobasis depygis Say.

Falls of the Ohio. Specimens in State Museum marked Wabash River.

123. Goniobasis livescens Menke.

Lake Maxinkuckee, Marshall County; Bass Lake, Starke County; St. Mary's and Maumee and Ft. Wayne (Call).

124. Goniobasis infantula Lea.

Falls of the Ohio near Shippingport (Call).

125. Goniobasis pulchella Anthony.

Big Indian Creek, Corydon; Blue River, Wyandotte; White River, Indianapolis.

126. Goniobasis interlineata Anthony.

Christy Creek, type locality.

127. Goniobasis intersita Hald.

Swan Creek, type locality (Mrs. Say).

128. Goniobasis semicarinata Say.

Small streams flowing from Hamer's Cave at Mitchell; Muscatatuck River, North Vernon.

129. Goniobasis louisvillensis Lea.

Falls of the Ohio.

130. Goniobasis gracilior Anthony.

Turkey Lake, Kosciusko County; Manitou Lake, Rochester.

131. Goniobasis brevispira Anthony.

Tippecanoe River, Carroll County; Sharp's Spring, Wyandotte.

132. Goniobasis indianensis Pilsbry.

Blue River, Wyandotte, Crawford County.

133. Anculosa costata Anthony.

Ohio River, New Albany.

134. Anculosa trilineata Say.

Ohio River, Lawrenceburg. Described from the Falls of the Ohio.

135. Anculosa prærosa Say.

Ohio River, Lawrenceburg; Falls of the Ohio. Common.

Family AMNICOLIDÆ.

Sub-family BYTHINIINÆ.

136. Bythinia tentaculata Linne.

Lake Michigan at Pine, Millers and Michigan City.

Sub-family HYDROBIINÆ.

137. Amnicola limosa Say.

Lake Michigan, Michigan City; Bass Lake, Starke County; Tippecanoe Lake, Kosciusko County; Cedar Lake, Lake County.

137a. A. limosa parva Lea.

Turkey and Tippecanoe lakes, Kosciusko County; Bass Lake, Starke County.

137b. A. limosa porata Say. (*Amnicola porata* Say).

Tippecanoe Lake, Kosciusko County; Bass Lake, Starke County.

138. Amnicola lustrica Pils.

Turkey and Tippecanoe lakes, Kosciusko County; Lake Maxinkuckee, Marshall County; Berry Lake, Lake County (Baker).

139. Amnicola walkeri Pils.

Grassy Creek, Kosciusko County.

140. Amnicola cincinnatiensis Anthony.

Lake Michigan at Millers.

141. Amnicola emarginata Kuster. (*Bythinella obtusa* Lea).

Lake Michigan at Millers.

142. Paludestrina nickliniana Lea.

Berry Lake, Lake County.

143. Somatogyrus subglobosus Say. (*Somatogyrus isogonus* Say).

Ohio River, Lawrenceburg; George Lake, Lake County (Baker).

144. Somatogyrus integer Say.

Ohio River near Madison; Ohio River, Charleston (Call).

145. Pomatiopsis lapidaria Say.

Indianapolis, Seymour, Lawrenceburg, Calumet Lake, Lake County.

Family VALVATIDÆ.

146. Valvata sincera Say.

Lake Michigan, Millers and Michigan City.

147. Valvata tricarinata Say.

Lake Michigan at Millers; Grassy Creek, Kosciusko County; Lake James, Steuben County; Lake Maxinkuckee, Marshall County; Cedar Lake, Lake County.

147a. V. tricarinata confusa Walker.

147b. V. tricarinata unicarinata De Kay.

147c. V. tricarinata simplex Gld.

Cedar Lake, Lake County.

148. Valvata bicarinata Lea.

Lake Michigan.

148a. V. bicarinata normalis Walker.

Lake Michigan, Millers.

Family VIVIPARIDÆ.

149. Vivipara subpurpurea Say.

Wabash River, Grand Chain, Posey County; Big Creek and Hovey's Lake, Posey County; Wabash River, Knox County; Ohio River, Mt. Vernon.

150. Vivipara contectoides Binney.

Bass Lake, Starke County; Foote's Pond, Gibson County; Dan's Pond, Knox County; Lake Michigan, Millers.

151. Vivipara intertexta Say.

Cypress swamps, Knox County; Wabash River, Knox and Gibson counties.

152. Campeloma ponderosum Say.

Wabash River, Lafayette, Terre Haute, New Harmony; Ohio River, Mt. Vernon; Muscatatuck River, North Vernon.

153. Campeloma subsolidum Anthony.

Wabash River, Lafayette, Terre Haute; Kankakee River, Riverside; Eel River, North Manchester.

154. Campeloma decisum Say.

Bass Lake, Starke County; Kankakee, St. Mary's, St. Joseph and Maumee rivers (Call).

155. Campeloma rufum Hald.

Tippecanoe and Turkey lakes, Kosciusko County; Pine and Stone lakes, Laporte County; Lake Michigan, Millers. Lafayette, Indianapolis, Huntington and Ft. Wayne (Call).

156. Campeloma integrum De Kay.

Webster Lake, Kosciusko County; Clear Lake, Steuben County; Lake Michigan, Millers.

157. Campeloma obesa Lewis.

White River and Canal at Indianapolis.

158. Lioplax subcarinata Say.

Wabash River, Grand Chain, Posey County; White, Ohio and Blue rivers (Call).

Family SPHÆRIIDÆ.

159. Sphærium vermontanum Prime.

Lake Michigan, Millers.

160. Sphærium solidulum Prime.

Muscatatuck River, North Vernon.

161. Sphærium stamineum Con.

White River, Indianapolis; Muscatatuck River, North Vernon; Lake Michigan, Michigan City; Tippecanoe and Turkey lakes, Kosciusko County.

162. Sphærium striatinum Lam.

Tippecanoe Lake, Kosciusko County; Muscatatuck River, North Vernon; Corydon.

163. SPHÆRIUM SIMILE Say. (*Sphærium sulcatum* Lam.).

Turkey Lake, Kosciusko County; Lake Maxinkuckee, Marshall County; Wabash River, New Harmony.

164. SPHÆRIUM FABALE Prime.

Lake Michigan, Michigan City; Wabash River, New Harmony.

165. SPHÆRIUM OCCIDENTALE Prime.

Kankakee River, Laporte County; cypress swamps, Knox County; Tippecanoe Lake and pond at Vawter Park, Kosciusko County.

166. SPHÆRIUM RHOMBOIDEUM Say.

Turkey Lake, Kosciusko County; Lake Michigan at Millers.

167. SPHÆRIUM FLAVUM Prime.

Turkey Lake, Kosciusko County; variety from Lake Michigan at Millers.

168 CALYCULINA TRANSVERSA Say. (*Sphærium transversum* Say.)

Big Creek, Posey County; Wabash River, New Harmony.

169. CALYCULINA TRUNCATA Linsley.

Turkey and Tippecanoe lakes, Kosciusko County.

170. CALYCULINA SECURIS Prime.

Grassy Creek, Tippecanoe and Turkey lakes, Kosciusko County.

171. CALYCULINA PARTUMEIA Say. (*Sphærium partumeium* Say).

Grassy Creek, Kosciusko County.

172. CALYCULINA ROSACEA Prime.

Grassy Creek and Turkey Lake, Kosciusko County.

173. PISIDIUM ABDITUM Hald.

Berry Lake and Millers (Baker); Ohio and Wabash rivers, Brookville (Call).

174. PISIDIUM VIRGINICUM Bourg.

English Lake, Kankakee River.

175. PISIDIUM ROTUNDATUM Prime.

Grassy Creek, Tippecanoe and Turkey lakes, Kosciusko County.

176. Pisidium compressum Prime.

Grassy Creek and Turkey Lake, Kosciusko County; Bass Lake, Starke County; Lake Maxinkuckee, Marshall County; Kankakee River and Danville.

177. Pisidium danielsi Sterki (Ms.).

Spring near Lake James, Steuben County.

178. Pisidium obtusale C. Pfr.

Spring near Lake James, Steuben County.

179. Pisidium nov-eboracense Prime.

Grassy Creek and Turkey Lake, Kosciusko County; Bass Lake, Starke County.

180. Pisidium variabile Prime.

Bass Lake, Starke County; Turkey Lake, Kosciusko County; Lake Maxinkuckee, Marshall County; English Lake, Kankakee River.

181. Pisidium idahoense Roper.

Lake Michigan, Millers.

182. Pisidium politum Sterki.

Grassy Creek, Kosciusko County.

183. Pisidium vesiculare Sterki.

Bass Lake, Starke County.

184. Pisidium pauperculum Sterki.

Lake Maxinkuckee, Marshall County; Bass Lake, Starke County; Turkey Lake, Kosciusko County.

185. Pisidium scutellatum Sterki.

Lost Lake, Marshall County.

186. Pisidium splendidulum Sterki.

Grassy Creek and Turkey Lake, Kosciusko County; Bass Lake, Starke County.

187. Pisidium roperi Sterki.

Grassy Creek and Tippecanoe Lake, Kosciusko County; Danville (Sterki).

188. Pisidium medianum Sterki.

Bass Lake, Starke County.

189. PISIDIUM TENUISSIMUM Sterki.
Bass Lake, Starke County; Lake Maxinkuckee, Marshall County.

190. PISIDIUM AFFINE Sterki.
Turkey Lake, Kosciusko County.

191. PISIDIUM SARGENTI Sterki.
Bass Lake, Starke County.

192. PISIDIUM STRENGI Sterki.
Bass Lake, Starke County.

193. PISIDIUM KIRKLANDI Sterki.
Berry Lake, Lake County (Baker).

Family UNIONIDÆ.

194. TRUNCILLA TRIQUETRA Raf. (*Unio triangularis* Barnes).
Tippecanoe, Wabash, Blue, White, Muscatatuck and Eel rivers.

195. TRUNCILLA SULCATA Lea. (*Unio sulcatus* Lea).
Wabash River, Lafayette; White River, Marion County, Ohio River (Stein).

196. TRUNCILLA FOLIATA Hild. (*Unio foliatus* Hild.).
Ohio and Wabash rivers (Stein).

197. TRUNCILLA PERSONATA Say. (*Unio personatus* Say).
Wabash River, New Harmony. Authentic specimen in State Museum.

198. TRUNCILLA PERPLEXA Lea. (*Unio perplexus* Lea).
Wabash River, New Harmony; Ohio River (Stein).

198a. T. PERPLEXA RANGIANA Lea.
Wabash River, Lafayette; Tippecanoe River, Monticello; White River (Stein).

199. TRUNCILLA SAMPSONII Lea.
Wabash River; Grand Chain, Posey County.

200. MICROMYA FABALIS Lea. (*Unio fabalis* Lea).
White, Wabash and Tippecanoe rivers; Tippecanoe Lake, Kosciusko County.

201. Lampsilis ventricosus Barnes. (*Unio ventricosus* Barnes; *Unio subovatus* Say).

Common all over the State.

202. Lampsilis capax Green. (*Unio capax* Green).

Wabash River, New Harmony and Grand Chain; Ohio River.

203. Lampsilis ovatus Say.

Wabash River, Terre Haute, Lafayette; Ohio River.

204. Lampsilis multiradiatus Lea. (*Unio multiradiatus* Lea).

Wabash, Tippecanoe, Blue, White, Eel and Ohio rivers; Tippecanoe Lake. Common.

205. Lampsilis luteolus Lam. (*Unio luteolus* Lam.).

Common all over the State.

206. Lampsilis ligamentinus Lam. (*Unio ligamentinus* Lam.).

Common all over the State.

207. Lampsilis orbiculatus Hild. (*Unio orbiculatus* Hild.).

Wabash River, Terre Haute; Ohio River.

208. Lampsilis anodontoides Lea. (*Unio teres* Raf.).

Kankakee, Eel, Tippecanoe, White, Wabash and Ohio rivers.

209. Lampsilis fallaciosus Simpson.

Wabash River, Lafayette; Tippecanoe River, Carroll County.

210. Lampsilis rectus Lam. (*Unio rectus* Lam.).

Common in all the rivers of the State.

211. Lampsilis subrostratus Say. (*Unio subrostratus* Say).

Wabash, Eel and Ohio rivers; Foote's Pond, Gibson County; Tippecanoe Lake, Kosciusko County; Lake Maxinkuckee, Marshall County; Manitou Lake, Fulton County.

212. Lampsilis lienosus Con.

White River and canal at Indianapolis. Abundant.

213. Lampsilis nigerrimus Lea.

White River, Rockford.

214. Lampsilis iris Lea. (*Unio iris* Lea).

All over the State.

215. Lampsilis ellipsiformis Con. (*Unio spatulatus* Lea).

Salt Creek, Porter County; Ohio, Wabash and Eel rivers (Call).

216. LAMPSILIS PARVUS Barnes. (*Unio parvus* Barnes).

White River, Indianapolis; Wabash River, New Harmony; Big Indian Creek, Corydon.

217. LAMPSILIS GLANS Lea. (*Unio glans* Lea).

White River, Rockford; Tippecanoe Lake, Kosciusko County; Wabash River, New Harmony.

218. LAMPSILIS ALATUS Say. (*Unio alatus* Say).

Wabash, Ohio, Kankakee and White rivers. Common.

219. LAMPSILIS GRACILIS Barnes. (*Unio gracilis* Barnes).

Ohio, Wabash, White and Tippecanoe rivers. Common.

220. LAMPSILIS LÆVISSIMUS Lea. (*Unio lævissimus* Lea).

Wabash River, Terre Haute, Lafayette and New Harmony; Ohio River.

221. LAMPSILIS LEPTODON Raf. (*Unio tenuissimus* Lea).

Wabash River, New Harmony, Lafayette and Terre Haute.

222. LAMPSILIS BLATCHLEYI Daniels.

Wabash River, Grand Chain, Posey County.

223. OBOVARIA RETUSA Lam. (*Unio retusus* Lam.).

White River, Indianapolis, Rockford; Wabash River, Lafayette, Terre Haute, New Harmony.

224. OBOVARIA CIRCULUS Lea. (*Unio circulus* Lea).

Ohio, Wabash, Tippecanoe, White and Eel rivers.

225. OBOVARIA LENS Lea.

Ohio, Wabash, Tippecanoe, White and Eel rivers.

226. OBOVARIA ELLIPSIS Lea. (*Unio ellipsis* Lea).

Wabash River, Lafayette, Terre Haute, New Harmony; Ohio River, New Albany.

227. PLAGIOLA SECURIS Lea. (*Unio lineolatus* Raf.).

Wabash River, Lafayette, Terre Haute, New Harmony, Grand Chain; Ohio River, New Albany.

228. PLAGIOLA ELEGANS Lea. (*Unio elegans* Lea).

Ohio, Wabash, Tippecanoe, White and Kankakee rivers.

229. PLAGIOLA DONACIFORMIS Lea. (*Unio donaciformis* Lea).

Ohio, Wabash, White and Tippecanoe rivers.

230. **Tritogonia tuberculatus** Barnes. (*Unio tuberculatus* Barnes).
Common in the Ohio and lower Wabash rivers; White River, Rockford; Blue River, Crawford County.

231. **Cyprogenia irrorata** Lea. (*Unio irroratus* Lea).
Ohio, Wabash and White rivers. Common.

232. **Obliquaria reflexa** Raf. (*Unio cornutus* Raf.).
Common in the Ohio, Wabash and White rivers.

233. **Ptychobranchus phaseolus** Hild. (*Unio phaseolus* Hild.).
Ohio, Wabash, Tippecanoe and White rivers; Tippecanoe Lake, Kosciusko County.

234. **Strophitus edentulus** Say. (*Anodonta edentula* Say; *A. wardiana* Lea).
Common in all the larger streams in the State; Tippecanoe Lake, Kosciusko County.

234a. **S. edentulus pavonius** Lea.
Wabash, Tippecanoe and White rivers; Big Indian River, Corydon.

235. **Anodonta imbecillis** Say.
Ohio, Wabash and White rivers; Lily Lake, Laporte.

236. **Anodonta suborbiculata** Say.
Dan's Pond, Knox County; Foote's Pond, Gibson County, rare; Wier's Lake, Posey County, common; White River, Rockford.

237. **Anodonta grandis** Say. (*Anodonta salmonia* Lea).
Rivers and ponds throughout the State.

237a. **A. grandis footiana** Lea.
Turkey Lake, Kosciusko County; Manitou Lake, Fulton County.

238. **Anodonta corpulenta** Cooper.
Clear Lake, Laporte.

239. **Anodonta kennicottii** Lea.
Turkey Lake, Kosciusko County.

240. **Lastena lata** Raf. (*Anodonta dehiscens* Say).
Ohio, Wabash and Tippecanoe rivers.

241. **Anodontoides ferussacianus** Lea.
Lake Michigan, Millers.

241a. A. FERUSSACIANUS SUBCYLINDRACEUS Lea. (*Anodonta subcylindracea* Lea).

Wabash River; Berry Lake, Lake County (Baker).

242. ARCIDENS CONFRAGOSUS Say. (*Margaritana confragosa* Say).

Wabash River, Lafayette, Terre Haute and New Harmony; ponds in Posey County.

243. SYMPHYNOTA COMPRESSA Lea. (*Unio pressus* Lea).

Wabash, White and Tippecanoe rivers.

244. SYMPHYNOTA COSTATA Raf. (*Margaritana rugosa* Barnes).

Wabash, Ohio, White, Tippecanoe, Blue, Kankakee and Eel rivers.

245. SYMPHYNOTA COMPLANATA Barnes. (*Margaritana complanata* Barnes).

Common in all the rivers of the State.

246. ALASMIDONTA CALCEOLA Lea. (*Margaritana deltoidea* Lea).

Lake Maxinkuckee, Marshall County; Moots Creek, White County; Big Indian River, Harrison County; Salt Creek, Porter County; Wolf Lake (Baker).

247. ALASMIDONTA TRUNCATA B. H. Wright. (*Margaritana marginata* Say).

In nearly all of the rivers and several of the lakes and ponds.

248. HEMILASTENA AMBIGUA Say. (*Margaritana hildrethiana* Lea).

Wabash River, Grand Chain, Posey County; White River, Rockford.

249. MARGARITANA MONODONTA Say.

Grand Chain, Posey County; Falls of the Ohio near New Albany (Call).

250. UNIO GIBBOSUS Barnes.

Common in the larger streams of the State; Turkey and Tippecanoe lakes, Kosciusko County; Lake Maxinkuckee, Marshall County.

251. UNIO CRASSIDENS Lam.

Ohio, Wabash and Tippecanoe rivers.

252. UNIO TETRALASMUS Say.

Ohio and Wabash rivers (Call).

252a. U. TETRALASMUS SAYI Ward.

Montour's Pond, Knox County.

253. PLEUROBEMA CLAVA Lam. (*Unio clavus* Lam.).
Wabash River, Lafayette, Terre Haute, New Harmony; Tippecanoe River.

254. PLEUROBEMA ÆSOPUS Green. (*Unio cyphyus* Raf.).
Tippecanoe River, Monticello; Wabash River, Lafayette, Terre Haute and New Harmony; Ohio River, New Albany.

255. PLEUROBEMA CICATRICOSA Say. (*Unio varicosus* Lea).
Wabash River.

255a. QUADRULA PLICATA Say.* (*Unio plicatus* Le Sueur).
Common in the Ohio and lower Wabash rivers.

256. QUADRULA UNDULATA Barnes.
Ohio, Wabash, White, Eel, Blue and Tippecanoe rivers.

257. QUADRULA HEROS Say. (*Unio multiplicatus* Say).
Wabash River, Lafayette, Terre Haute, New Harmony; Ohio River, Mt. Vernon.

258. QUADRULA CYLINDRICUS Say. (*Unio cylindricus* Say).
Common in the Ohio, Wabash, White, Eel and Tippecanoe rivers.

259. QUADRULA METANEVRA Raf. (*Unio metanevrus* Raf.).
Ohio, Wabash, White and Blue rivers.

260. Q. METANEVRA WARDII Lea.
Wabash River.

261. QUADRULA LACHRYMOSA Lea. (*Unio lachrymosus* Lea).
Wabash River, Terre Haute and New Harmony; Ohio River.

262. QUADRULA FRAGOSA Conrad. (*Unio fragosus* Conrad).
Wabash River, Gibson County.

263. QUADRULA PUSTULOSA Lea. (*Unio pustulosus* Lea).
Common in the Ohio, Wabash, White and Tippecanoe rivers.

264. QUADRULA COOPERIANA Lea. (*Unio cooperianus* Lea).
Wabash River.

265. QUADRULA PUSTULATA Lea. (*Unio pustulatus* Lea).
Wabash River, Terre Haute and New Harmony; Ohio River, Mt. Vernon.

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*This is not a variety of *Pleurobema cicatricosa* Say. The number was accidentally omitted in the text, and the number 255a has been given it for that reason.

266. QUADRULA RUBIGINOSA Lea. (*Unio rubiginosus* Lea).

Common in all of the streams and most of the lakes of the State.

267. QUADRULA TRIGONA Lea. (*Unio trigonus* Lea).

Tippecanoe Lake, Kosciusko County; Ohio, Wabash, Blue, Tippecanoe and White rivers.

268. QUADRULA OBLIQUA Lam. (*Unio obliquus* Lam.).

Wabash River, Terre Haute and New Harmony; Ohio River.

269. QUADRULA COCCINEA Con. (*Unio coccineus* Lea).

Common in all of the larger streams of the State; Lake Maxinkuckee, Marshall County; Tippecanoe Lake, Kosciusko County.

270. QUADRULA SOLIDA Lea. (*Unio solida* Lea).

Wabash River, Terre Haute and New Harmony; Ohio River, Mt. Vernon.

271. QUADRULA PLENA Lea.

Wabash River, Terre Haute, New Harmony and Lafayette; Tippecanoe River, Carroll County.

272. QUADRULA PYRAMIDATA Lea.

Tippecanoe River, Carroll County, common; Wabash River, Lafayette and Terre Haute.

273. QUADRULA SUBROTUNDA Lea.

Wabash River, Lafayette, Terre Haute, New Harmony; Tippecanoe River, Carroll County.

274. QUADRULA EBENUS Lea. (*Unio ebenus* Lea).

Wabash River, Terre Haute and Grand Chain, Posey County; Knox County, White River.

275. QUADRULA TUBERCULATA Raf. (*Unio verrucosus* Barnes).

Common in all the streams of the State.

276. QUADRULA GRANIFERA Lea. (*Unio graniferus* Lea).

Ohio River.

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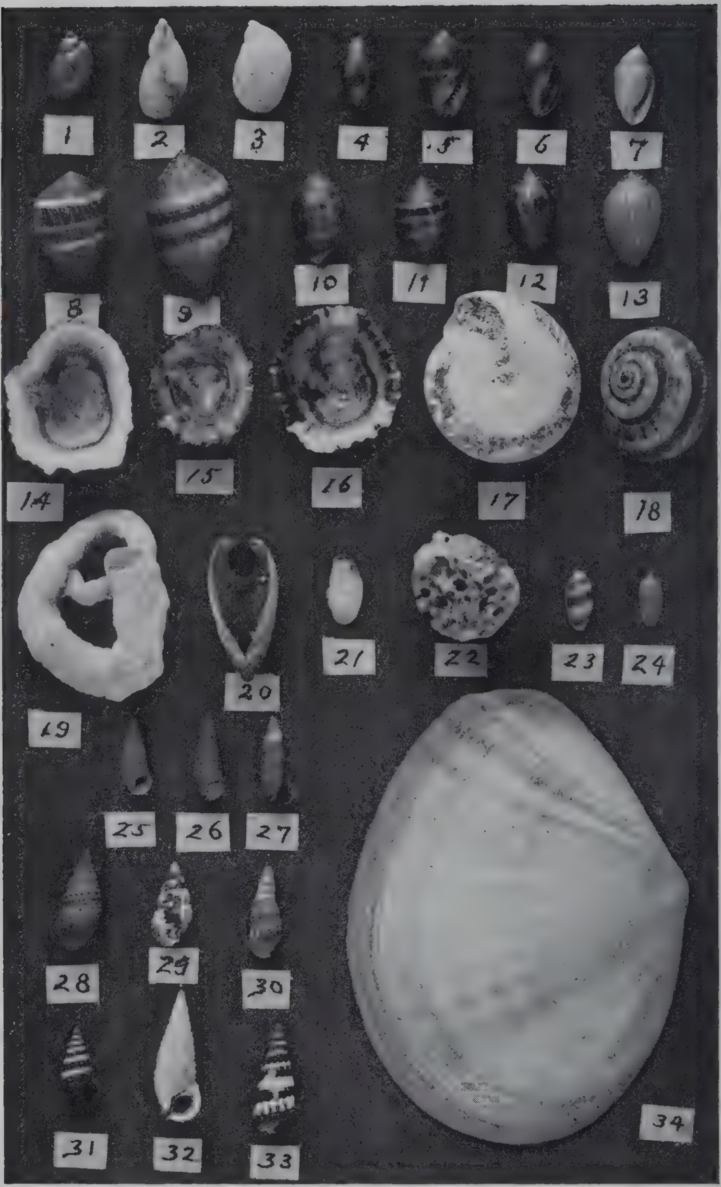

DAVIS: BERMUDA SHELLS.

NOTES ON THE MOLLUSCA OF THE BERMUDA ISLANDS.

BY C. ABBOTT DAVIS, S. B.

Last July and August were profitably spent in collecting insects and mollusks among the three hundred beautiful islands now called the Bermudas. Like the Hawaiian group, they are chiefly interesting because of their isolated geographical position, being nearly 700 miles distant from any other land. Commerce, however, is rapidly changing the fanna and flora of Bermuda to such an extent that old records, *i. e.*, records of twenty years standing, are obsolete or unreliable. Large quantities of West Indian shells are constantly being brought to the island to sell to the unsophisticated traveller, and some of the stores actually sell these shells as Bermudian. Even the native colored boys are anxious to sell shells for "tuppence," and they are not particular about the historical side, so that one has to beware of all shells not collected in situ.

The expeditions of Prof. Helprin in the summer of 1888, and of Prof. Verrill in the spring of 1898 and of 1901, form the nucleus of most of the authentic published data. I had planned a trip to Bermuda for July and August 1903, but upon learning of the Bristol-Mark expedition, I decided to go with them, and the following notes are a part of the records of our trip.

In 1900, Dr. Pilsbry revised the "Air-breathing Mollusks of the Bermudas," and my research differs little except in minor details. For instance, he agrees with Mr. Smith that *Succinea bermudensis* Pfr., is *S. barbadensis* Guild., but states that the animals need a careful study. I agree with the latter statement and as proof of it illustrate three Bermudian forms. Fig. 1 is the common form, Fig. 2 was occasionally taken at Flatts, Fig. 3 is the fossil variety.

Physa acuta Drap., has not been recorded since G. Brown Goodes' record of 1888. We took it from rain-water tanks in Devonshire Swamp.

The variety *pulchella* Pfr., of *Truncatella caribæensis* Sowb., is always found *dead*. This, taken with the fact that this mollusk lives at the high-tide mark, and is therefore apt to be water-worn, makes *pulchella* simply a worn *carribæensis*.

In a lot of several hundred *carribæensis* received recently from the West Indies, there is a complete series showing the wear on these shells, even to fresh transparent specimens. Prof. Verrill has lately added the following to Dr. Pilsbry's list:

Blauneria heteroclita Montg., *Hyalina lucida* Drap.
Pœciloronites zonata Verr. (Fig. 17), *Siphonaria henica* Verr.

My records add the following:

Carychium exiguum Say. (var.). Sub-fossil.
Vitrea cellaria Müll. Several at Hamilton.
Helix pisana Müll. Several at St. Georges (Fig. 18).
Planorbis dilatatus Gld. Dev. Swamps, (Brackish water).
Paludestrina tenuipes Cooper (var.). Eve's Pond.

The beautiful genus *Melampus* needs revision, and as I collected (personally) several quarts of these bewildering shells, I will attempt the following key to the Bermudian forms:

A. Aperture narrow and short, shells small, pointed at both ends, greasy, brownish or blackish, no teeth (see Fig. 4). *M. bulloides* Mont.

B. Aperture wider and longer, at the extreme base a very prominent fold, shells larger, apex pointed, greasy, color brownish or purplish, with one or more revolving white or yellowish bands, row of teeth within the outer lip very numerous, (Fig. 5). *M. flavus* Gmel.

   1. Color plain brown or purple, no stripes, (Fig. 6). Var. *purpureus* n. v.
   2. Size and shape same as *purpureus*, immaculate white when alive, rare, found only at Hungry Bay, (Fig. 7). Var. *albus* n. v.

C. Aperture still wider, shell wide at the top, apex abrupt, two or more well developed teeth on the inner lip, often attaining to double the size of *flavus*, not green, (Fig. 8 is the Florida form). *M. coffeus* Linn.

   1. Larger, and apex more pointed than in *coffeus*, the row of teeth in outer lip very irregular and uneven, banded spirally, with brown and white, width of bands *very irregular*, (Fig. 9). Var. *gundlachi*, Pfr.

2. Pilsbry says: "Scarcely if at all to be distinguished from the prior *M. gundlachi* Pfr., but not attaining so large a size." These are probably the juvenile *gundlachi*, the lack of color and lustre in the large ones being due to longer exposure and yet they look like another variety so the smaller ones are called (Fig. 10). Var. *redfieldi*, Pfr.
3. Size and shape same, but the revolving bands of light and dark color *alternate evenly*, (Fig. 11).
Var. *alternatus* n. v.
4. Smaller, darker, polished, beautifully mottled with more or less prominent *vertical* stripes, (Fig. 12).
Var. *verticalis* n. v.
5. Stout, *plain brown* form, with no markings whatever. (Fig. 13). Var. *bishopii* n. v.

Named in honor of mine host Mr. Geo. A. Bishop, Supt. of Public Gardens, Hamilton, Bermuda.

As to *Siphonaria*, Verrill has described in the "Transactions of the Conn. Academy of Science," a species called *S. henica.* So far as is known, only one specimen—the type—is in existence. This was taken at Bailey Bay on the north shore. We collected over three pints of *S. alternata* Say, and found many of the var. *brunnea* Hanley, also two others.

2. Shell small (size 16 x 13 mm.), blackish, opaque *opalescent*, rare, Hungry Bay, south shore (Fig. 15). Var. *opalescens* n. v.

3. *Intermediate* in size and coloration between *brunnea* and *opalescens.* Very thin, translucent, always distinguished by radial black lines from apex to margin, covering the whole or a part of the inner surface. Common on the south shore at high-tide mark (Fig. 16).
Var. *intermedia* n. v.

There are undoubtedly many marine species which might be added to the published lists of Dall, Heilprin, Verrill, and others; but the great difficulty just now is to eliminate equivalent nomenclature. I have not seen records of the following species taken by us in Bermuda:

Acmæa punctulata Gmel.
Anachis catenata Sowb.
Alabina adamsii Dall.
Asaphis deflorata Linn.
Bittium varium Pfr.
Ocinebra intermedia Ads.
Nassa consensa Rav.
Natica livida Pfr.
Nitidella cribraria Linn.
Olivella rosalina Ducl.

Chione beaui Recl.
Chione pygmæa Lam.
Coralliophila abbreviata Lam.
Cypræacardia hornbeckiana Mörch.
Cythara simulata Rve.
Eulima gracilis Ads.
Gastrochæna ovata Sby. (Fig. 20.)
Litiopa bombyx Kein.
Ostrea folium Linn.
Pecten ornatus Lam.
Pitaria fulminata Mke.
Purpura undata Lam.
Rissoina pulchra Ads.
Semela proficua Pult.
Spirula australis Lam.
Tellina promera Dall.
Tellina sybaritica Dall.

Vermetus erectus Dall. This shell is quite common, but generally has the erect portion broken off, as in Fig. 19.

The following are undoubtedly new forms. Cotypes of each are deposited (with the *Melampus* and *Siphonaria*) in the museums at Washington, Philadelphia, Boston and Providence.

Gastrochæna mowbrayi sp. n. (Fig. 21).

This has often been mistaken for a juvenile *G. ovata*, (Fig. 20) as it resembles *ovata* in shape and color, but neither in size, nor habitat. In Bermuda *G. ovata* has an alt. of 20 mm. and bores a hole about 10 mm. in diameter in the solid brain-corals, or shell-rock.

On the other hand, *G. mowbrayi* is found in the dead or dying stems of the branch coral (*Oculina*) the entire stem of which could be put into a tube of *ovata*. *G. mowbrayi* occupies a cavity a little larger than the shell (which is about 6 x 3 mm., the cut showing an extremely large specimen) with a small opening to the outer surface of the coral. These shells are often grouped so closely together, as to undermine the strength of the coral, (see Fig. 22). Locality, Harrington Sound, dredged in 20 to 40 ft. Named in honor of Mr. Lewis Mowbray an enthusiastic Bermudian naturalist.

Tellina lævigata Linn., var. *stella* n. v.

T. lævigata is called the "sunset shell" by the natives, and it well deserves the name on account of its beautiful bands of orange or pink alternating with delicate yellow tints. About one out of twenty of these shells has diverging, radial pink rays (like *T. radiata*). For this nameless variety I propose the name *stella* (Fig. 34) collected at Flatt's Inlet.

Volvaria avena Lam., var. *southwicki* n. v.

Volvaria avena (Fig. 23) is common along the north shore of

Bermuda, and is widely known and easily recognized by its conspicuous transverse orange bands, size 9 x 3 mm.

On Hamilton Beach I found a smaller constant variety (Fig. 24) which had a uniformly dark, mottled ground with no bands of color. Alt. 6 x 2 mm. This variety is named after my friend, Mr. Jas. M. Southwick, Curator of the Roger Williams' Park Museum, Providence, R. I.

Key to the Bermudian Species of the Genus Cerithium.

The species of this genus were the hardest to revise owing to the fact that the descriptions being brief and often inaccurately figured, no two museums have them named alike. A generous use of the microscope is necessary to distinguish species, and while there are undoubtedly intergrades, the majority are I think, distinct species and not varieties. They are so dissimilar that they can be readily separated. Most of the species may be picked up in Bermuda by the thousand. I brought home at least a half bushel for study.

A. Very small, jet-black inside and out, often decollate, nodules in *vertical rows of three dashes.* Bermuda form, Fig. 25; Haiti form, Fig. 26; white-tipped Florida form, Fig. 27.
C. minimum Gmel.

B. Larger, stouter, plain black or dirty brown inside and out, spirals very uneven, nodules in vertical rows of *three dots* (Fig. 28). *C. nigrescens* Mke.

C. Shell stout, spirals uneven, *handsomely variegated* black and white or yellow and white, nodules in vertical rows of three dots (Fig. 29). *C. variabile* Ads.

Note.—This shell has been called *eriense* Val., and even placed as a variety of *ferrugineum* Say, which it does not resemble in the least. (See the original figure and description of *ferrugineum* by Say.)

D. Long, narrow, yellowish-brown, spirals very irregular, three vertical nodules united, forming vertical ribs, by far the rarest form in Bermuda (Fig. 30). *C. ferrugineum* Say.

E. Long, narrow, apex sharp, black with a white revolving band below the suture, the black band contains dashes and the white band dots, spirals regular, blackish inside (Fig. 31).
C. septenstriatum Say.

F. Larger than any of the above, spirals regular. A whitish calcarious deposit distinguishes this shell (Fig. 32). When this covering is removed by acid or wear as in Fig. 33, it reveals a brownish interior with white bands on which the nodules are shaped like an exclamation point (!), the two upper dots being united. The apex is always very sharp.

C. albocoopertum sp. n.

Any other Bermudian records would be gratefully received by the writer, as he has in press a " Check-List of the Bermudian Mollusca."

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A NEW PEARLY FRESHWATER MUSSEL OF THE GENUS HYRIA FROM BRAZIL

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BY

L. S. FRIERSON
Of Frierson, Louisiana

No. 2053.—From the Proceedings of the United States National Museum,
Vol. 47, page 363, with Plate 12

Published October 29, 1914

FOR THE INCREASE AND DIFFUSION OF KNOWLEDGE AMONG MEN · PER ORBEM · SMITHSONIAN INSTITUTION · WASHINGTON · 1846

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1914

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A NEW PEARLY FRESHWATER MUSSEL OF THE GENUS HYRIA FROM BRAZIL.

By L. S. Frierson,
Of Frierson, Louisiana.

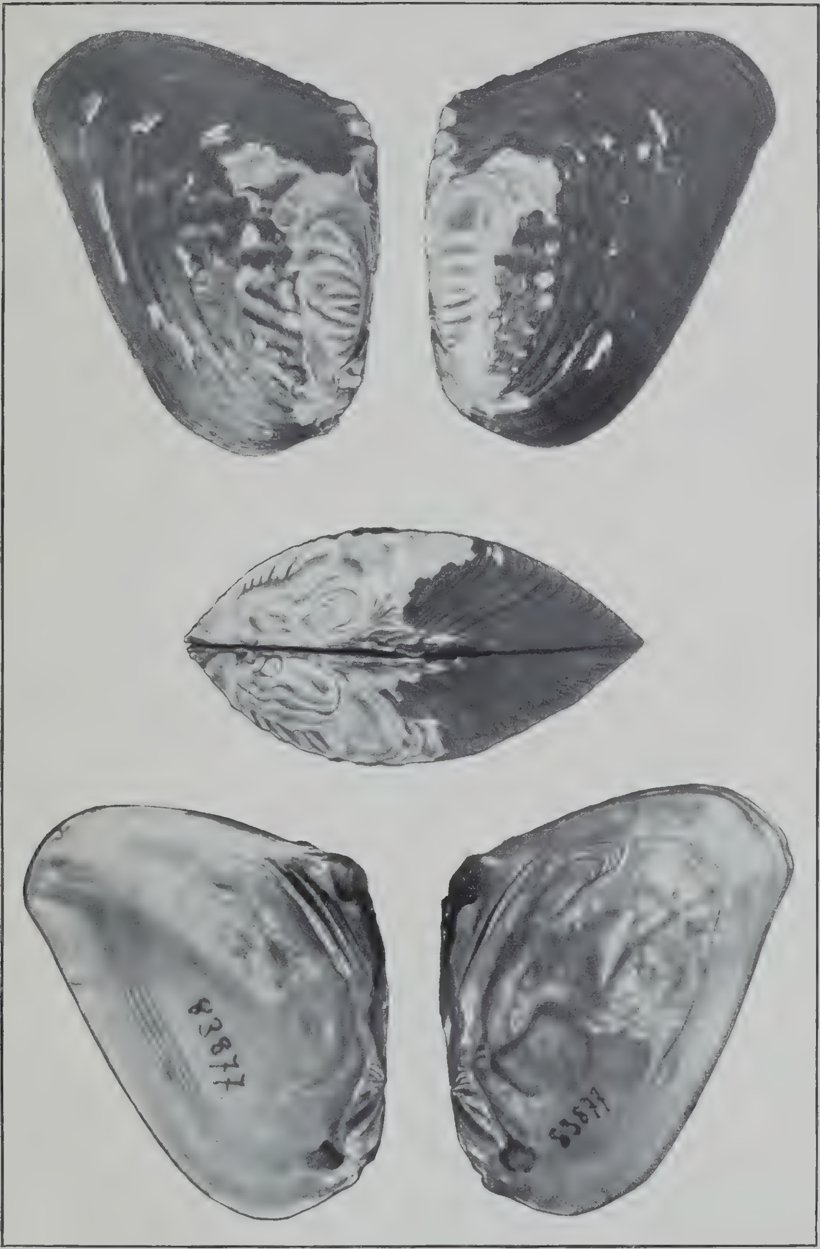
While looking over the Lea collection in the United States National Museum the shell to be described below was noted, the label attached to it being "*Hyria corrugata*, from the Amazon River, Brazil, from Captain Brown." It differs so much from that species indeed as to be only placed in *Hyria* on account of the radial beak sculpture, and epidermis. The shell resembles, perhaps, the *Prisodon brownianus* Lea more than it does the ordinary Hyrias, but that shell is smooth, and the teeth differ considerably. The shell is decidedly novel, and really appears to be a connecting link between the genera *Hyria* and *Diplodon*. (It is not impossible that this species may be the "*Hyria humilis* Troschel," unpublished so far as I am aware, a species said to be from Guiana, and referred to by Wiegmann in 1847, the name being suggestive.)

HYRIA AMAZONIA, new species.

Plate 12.

Shell small, solid, triangular, inflated. Length, 4; height, 2.7; diameter, 2 cm., narrow in front, and almost square with the base, which is straight almost to the posterior end, where there is a hint at a sulcus. The dorsum is nearly straight, rising into a slight wing, which in the type-specimen is just behind the middle. The posterior end descends rapidly to the rounded posterior point. The beaks are heavily radiately corrugated, breaking up in the center of the shell into pustulations, and becoming smooth next to the margin. Epidermis dull reddish brown, without other markings. The cavity of the shell is tray shaped, beak cavities very shallow. In the left valve there are two laterals, short, and remote from the cardinals, of which there is one low, compressed, and nearly vertical, in front, and a hint of another just beneath the beak. In the right valve there is one lateral and one low ragged split-up cardinal. The protractor-pedis scar is either absent or placed above the adductor scar, and is very small, confluent behind. Nacre white and purplish (somewhat diseased in the center of the type-specimen).

Type.—Cat. No. 83877, U.S.N.M.



HYRIA AMAZONIA FRIERSON.

FOR EXPLANATION OF PLATE SEE PAGE 363.

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no. 44

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REDISCOVERY OF POURTALES' HALIOTIS

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BY

JOHN B. HENDERSON
Of the Smithsonian Institution

No. 2091.—From the Proceedings of the United States National Museum,
Vol. 48, pages 659-661, with Plates 45-46.

Published May 22, 1915

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REDISCOVERY OF POURTALES' HALIOTIS

BY

JOHN B. HENDERSON
Of the Smithsonian Institution

No. 2091.—From the Proceedings of the United States National Museum,
Vol. 48, pages 659–661, with Plates 45–46

Published May 22, 1915

Washington
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1915

REDISCOVERY OF POURTALES' HALIOTIS.

By John B. Henderson,
Of the Smithsonian Institution.

During 1869 a series of dredgings were made under the direction of Count Pourtales by the U. S. Fish Commission steamer *Bibb* in the Straits of Florida. The mollusks obtained by the *Bibb* were sent to Washington, and thence, in due course of time, to William Stimpson in Chicago, to whose care they were intrusted for report and publication. Before Stimpson had entered upon this task the entire collection was destroyed in the great Chicago fire. While these shells were in Washington prior to their shipment to Chicago they were inspected by Dr. W H. Dall, who was greatly interested and astonished to find among the lot a specimen of a *Haliotis*. No representative of this genus had ever before been reported from western Atlantic waters. The discovery, therefore, of a *Haliotis* from Florida was an event important enough to inspire a more than casual scrutiny of the specimen, and its main characters became impressed upon his mind.

Some 20 years later, when publishing a preliminary report upon the mollusks collected by the *Blake*, Doctor Dall described from his memory this lost *Haliotis*, naming it in honor of Count Pourtales. The locality given clearly indicates that the specimen was a resident of the rocky strip of bottom lying just off the Florida Reef and since referred to by Alexander Agassiz as the "Pourtales Plateau."

In 1889 Doctor Dall published a report upon the mollusca taken by the *Albatross* in a voyage made from Norfolk, Virginia, to California. In this report he refers with some hesitancy a *Haliotis* collected in the Galapagos to *H. pourtalesii* and adds a new description of the species based upon the new examples taken by the *Albatross*. These specimens are in the United States National Museum collection (Cat. No. 96392).

Two years ago, while dredging from the *Eolis* along the inner edge of the Pourtales Plateau off Key West in 90 fathoms, I had the extreme good fortune to secure a *Haliotis*, although a small and somewhat immature specimen. Upon showing this to Doctor Dall, he at once pronounced it to be the true *Haliotis pourtalesii*, as the sight of the specimen itself refreshed his memory of the example taken so many years ago by Pourtales at about the same locality. A comparison with the Galapagos specimens above referred to immediately demonstrated the fact that the Atlantic and the Pacific "*pourtalesii*" were not the same, but, upon the contrary, very distinct species.

The importance of an east American representative of this essentially Pacific genus warrants a new description made from this unique specimen, now in the Museum collection (Cat. No. 271601). I give the following description and figure. The Galapagos Island species must receive a new designation. I take much pleasure in naming it in honor of Doctor Dall.

HALIOTIS (PADOLLUS) POURTALESII Dall.

Plates 45 and 46, upper figures.

1881. *Haliotis pourtalesii* Dall, Bull. Mus. Comp. Zool. Cambridge, vol. 9, No. 2, p. 79.
1889. *Haliotis pourtalesii* Dall, Bull. Mus. Comp. Zool. Cambridge, vol. 28, pp. 33 and 395.
1889. *Haliotis pourtalesii* Dall, Bull. U. S. Nat. Mus., No. 37, p. 168.
1903. *Haliotis pourtalesii* Dall, Bull. U. S. Nat. Mus., No. 37, p. 168. (Reprint.)
1911. *Haliotis pourtalesii* Henderson, Nautilus, vol. 25, No. 7, p. 81.
1914. *Haliotis pourtalesii* Cooke, Proc. Mal. Soc. London, vol. 11, pt. 2, p. 103.

Shell somewhat longer than wide. Holes 17, the last 5 open with prominent margins, the closed ones prominent and bulbous. Nucleus consisting of one full whorl, smooth. The characteristic sculpture begins with the postnuclear whorl in very fine spiral lines which develop gradually into sharply raised, irregularly waving, spiral threads with finer intercalated threads appearing and continuing to the edge of the aperture. At the end of the second whorl there are 10 of these threads between the suture and the line of holes; at the margin of the aperture, 23 to 27. Below the line of holes the threads are more widely spaced, the third one forming a decidedly angulated periphery. Base marked by four equal, equally spaced, spiral threads on the posterior half. Anterior half of the base smooth, excepting a slender spiral sulcus a little within the edge of the wide expanded aperture. The axial sculpture consists of rather regularly spaced lines of growth. Color wax yellow with deeper patches of orange; nacreous shining within.

Length, 11 mm.; width, 8 mm.

Dredged about 3 miles off Sand Key, Florida, in 90 fathoms, on sand patches among rocks, on the edge of the "Pourtales Plateau."

HALIOTIS (PADOLLUS) DALLI, new name.

Plates 45 and 46, lower figures.

1889. *Haliotis pourtalesii*? DALL, Proc. U. S. Nat. Mus., vol. 12, p. 355, pl. 12, figs. 1, 3.

1890. *Haliotis pourtalesii* PILSBRY, Man. Conch., ser. 1, vol. 12, p. 121, pl. 22, figs. 27, 28.

1893. *Haliotis pourtalesii*? STEARNS, Proc. U. S. Nat. Mus., No. 942, vol. 16, pp. 418, 448.

The following is Doctor Dall's description in full:

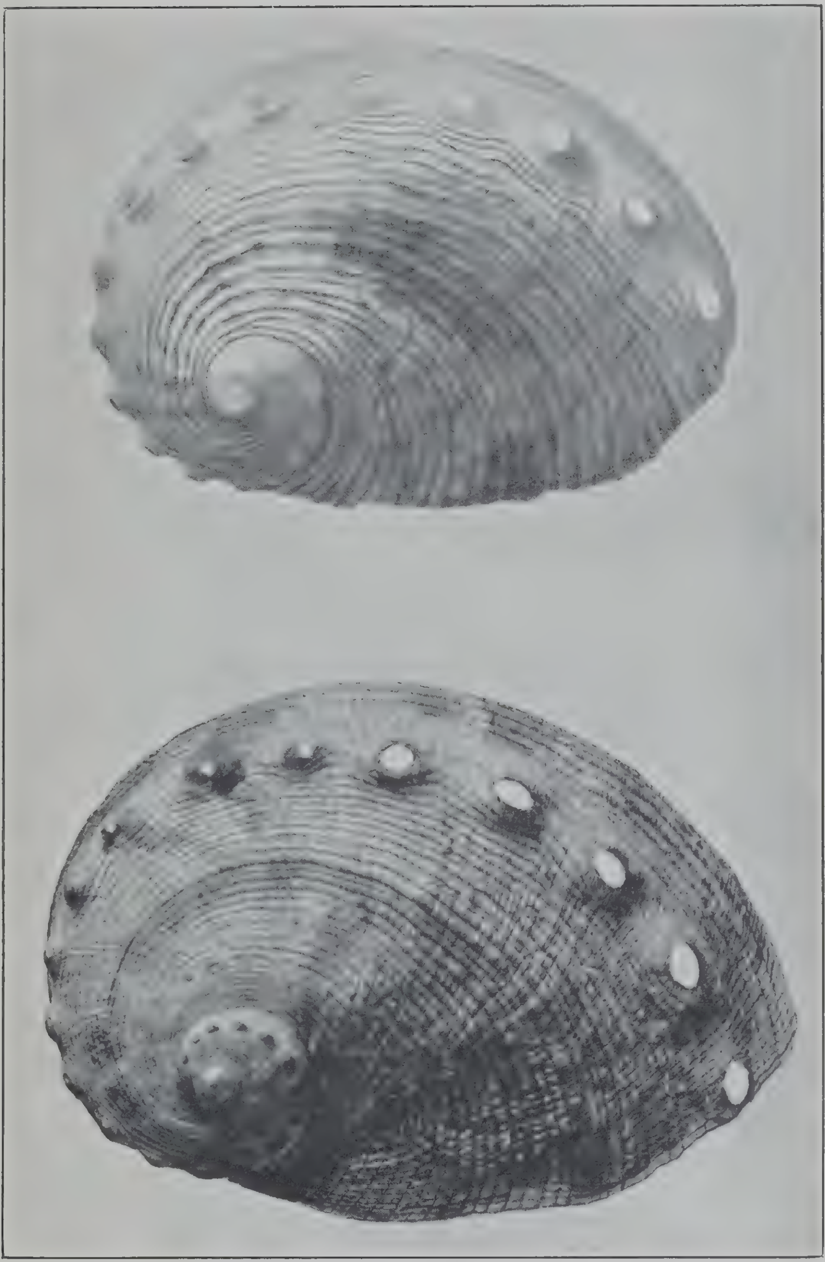
Shell small, of a pale brick-red color, with white dots on some of the spirals, rather elevated, with about 2½ whorls; apex small, prominent; holes about 25, of which 5 remain open, the margins of these rather prominent; outside the row of holes the usual sulcus is strongly marked; about midway from the suture to the lines of holes is a raised rib, rather obscure but differing in different individuals and corresponding to an internal sulcus; between the central ridge and the suture there are no undulations or transverse ridges of consequence; sculpture of well marked, rather flattish, spiral, close-set threads, sometimes with a single finer intercalary thread, overlaid by smaller rather compressed transverse ridges, in harmony with the incremental lines; on top of the spirals the ridges bulge like the threads of worsted on canvas embroidery; spire situated well forward and with sub-vertical sides; interior pearly, the coil of the spire rather close and the margin of the pillar flattened. Longitude of shell, 23; latitude, 18; altitude, 11.5; nucleus behind the anterior end, 17 mm.

Hab.—Station 2815, in 33 fathoms, sand; near Charles Island, of the Galapagos group, in the Pacific.

The nearest relative of this shell is *H. parva*, from the Cape of Good Hope, which differs from our specimens chiefly in the greater prominence of the central rib, and in being a little more circular in outline.

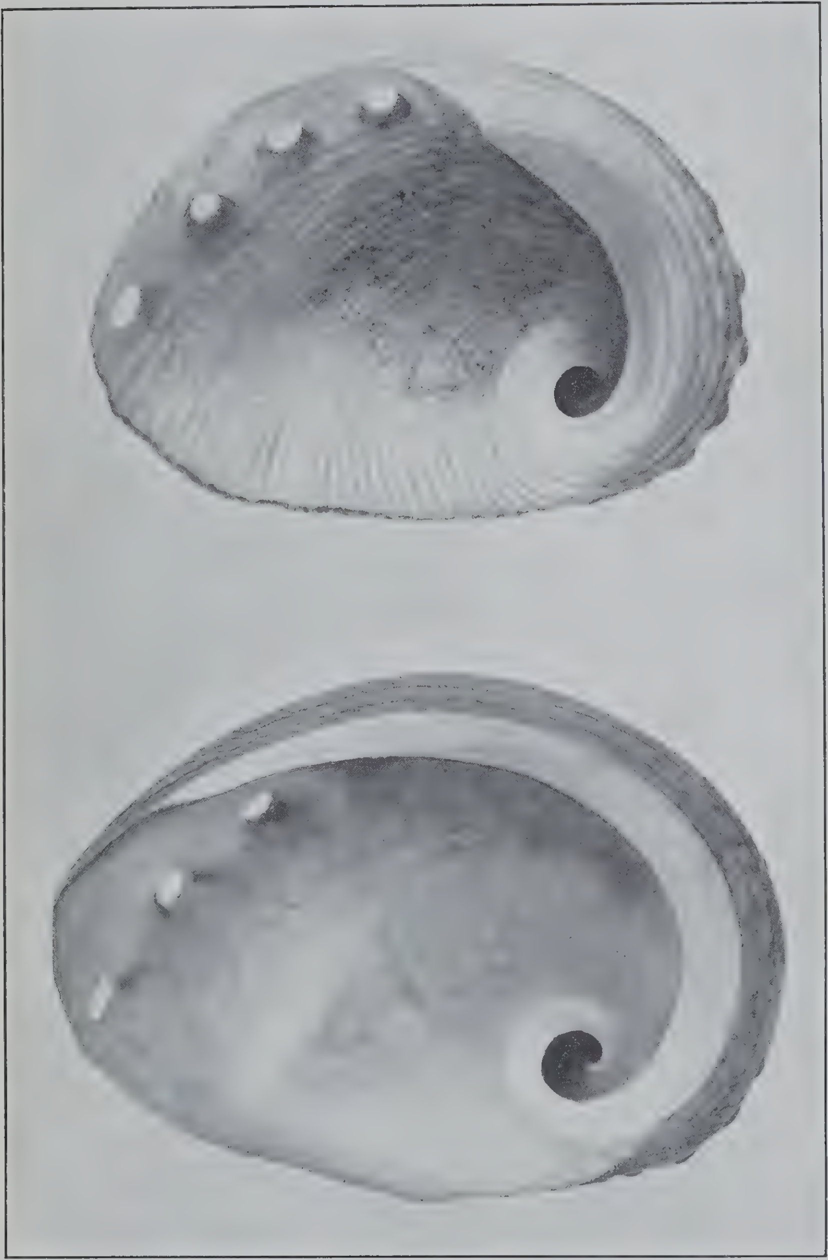
The shell from the Galapagos agrees so exactly with what we know of *H. pourtalesii* and with my own recollection of the type specimen destroyed in the Chicago fire, that I am unwilling to separate it, though the distance between the two localities is so great.

The occurrence of this shell at the Galapagos is of great interest apart from its supposed connection with the Floridian species. No species of *Haliotis* is known from the west coast of South America, of Central America, or of North America south of northern Mexico. There are one or two small not nearly related species in the Melanesian Islands and north Australia. So the present species is remarkably isolated. Nothing of the sort has been previously reported from the Galapagos. Two specimens were obtained, neither containing the soft parts. The original type of *H. pourtalesii* contained the animal. It would probably be referred to the section *Padollus*.



Outside Views of Haliotis pourtalesii and H. dalli.

For explanation of plate see pages 660 and 661.



INSIDE VIEWS OF HALIOTIS POURTALESII AND H. DALLI.

FOR EXPLANATION OF PLATE SEE PAGES 660 AND 661.

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LITTORAL MARINE MOLLUSKS OF CHINCOTEAGUE ISLAND, VIRGINIA

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BY

JOHN B. HENDERSON and PAUL BARTSCH
Of the United States National Museum

No. 2055.—From the Proceedings of the United States National Museum,
Vol. 47, pages 411–421, with Plates 13–14

Published October 29, 1914

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PER ORBEM
SMITHSONIAN·INSTITVTION·WASHINGTON·1846·

Washington
Government Printing Office
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LITTORAL MARINE MOLLUSKS OF CHINCOTEAGUE ISLAND, VIRGINIA.

By John B. Henderson and Paul Bartsch,
Of the United States National Museum.

INTRODUCTION.

During July, 1913, the writers made a short trip to Chincoteague, on the Atlantic shore of Accomac County, Virginia, for the purpose of ascertaining the local marine fauna. Owing to the inaccessibility of this strip of coast, generally known as the "Eastern Shore," collectors seem to have neglected it. At all events, there appear to be but few records and no critical lists published of the shallow water shells from any locality between Cape May, New Jersey, and Beaufort, North Carolina. Our chief desire was to find out of just what elements the molluscan fauna consisted—to see how many, if any, species of southern range lapped over from Hatteras, and what northern species still persisted in this faunal area. We were happy in our somewhat haphazard choice of a locality for we encountered at Chincoteague a greater variety of stations than likely can be found at any other one point along this section of the coast. There are, first, the interior sounds of very considerable extent. These are very shallow (4 to 12 feet), more or less thickly sown with oyster beds and with patches of eel grass, the bottom ranging from hard sand through varying degrees of hard clay to soft mud. Second, we found the unusual feature of a bight or protected cove formed by the southward drift at the southern end of Assateague Island, protected from heavy wave action by a long, curved sand spit. This bight has a soft mud bottom, with a temperature possibly 8° less than that of the open sea. The mud which we brought up with the dredge seemed almost icy to the touch. This condition is probably produced by cold springs seeping through the floor of the bight. This colder water of the bight yielded to our dredge *Yoldia limatula*, large and fine, and *Nucula proxima*, whereas just around the protective spit of sand, on the ocean side, we found dead Terebras of two species, some young *Busycon perversa* and a valve of *Cardium robustum*, a somewhat startling association of species. Then, lastly, we had the open sea, which here presumably differs in no manner from other open-sea stations along the 200 miles or more of this coast. The bottom drops off very gradually to the edge of the continental shelf, some 75 or 100 miles out.

The open-sea stations we occupied were, as might be expected, very poor. The smooth, hard sand bottom seemed almost barren of life, and the softer patches that we explored contained only many dead shells—mostly small bivalves. We should admit, however, that our work in the open sea was scarcely a good test, although we made probably 20 hauls from the shore out some 4 or 5 miles, but the chart soundings indicated some more promising areas of pebbly bottom a few miles beyond what we considered the safety zone for a small motor boat.

The inner waters of the sound we found unexpectedly rich in molluscan life, the species, for the most part, not having been taken outside or in the bight.

We spent but two full working days, and were fortunate in securing an excellent boat and obliging skipper. The material has been identified with great care, all the critical species having been subjected to the most rigorous investigation. The following is the list of our catch:

LIST OF SPECIES COLLECTED.

OSTREA VIRGINICA Gmelin.

ANOMIA GLABRA Verrill.

PECTEN GIBBUS IRRADIANS Lamarck.

MYTILUS EDULIS Linnaeus.

SCAPHARCA TRANSVERSA Say.

The typical as well as a varietal form occurs.

SCAPHARCA CAMPECHENSIS PEXATA Say.

Some specimens referable to the form *holmesii* Kurtz.

ARCA (NOETIA) PONDEROSA Say.

NUCULA PROXIMA Say.

Assateague Bight only.

YOLDIA LIMATULA Say.

Assateague Bight only. These specimens all show a tendency to turn up the pointed end, giving a slightly concave dorsal line from the beak to the anterior tip.

LEDA ACUTA Conrad.

VENERICARDIA GRANULOSA Say=**CARDITA BOREALIS** Authors.

VENERICARDIA (PLEUROMERIS) TRIDENTATA Say.

ASTARTE CASTANEA Say.

CRASSATELLA (ERIPHYLA) LUNULATA Conrad.

DIVARICELLA QUADRISULCATA Orbigny.

PHACOIDES AURANTIA Deshayes.

One valve on beach (adventitious?).

CARDIUM ROBUSTUM Solander=**CARDIUM MAGNUM** Born.

LÆVICARDIUM MORTONI Conrad.

VENUS MERCENARIA Linnaeus.

CHIONE CANCELLATA Linnaeus.

AGRIOPOMA CONVEXA Say. **CYTHEREA CONVEXA** Say. **CALLOCARDIA MORRHUANA** Lindsay.

PETRICOLA PHOLADIFORMIS Lamarck.

DONAX VARIABILIS Say.

TAGELUS GIBBUS Spengler.

TAGELUS DIVISUS Spengler.

ANGULUS TENERA Say.

PSAMMACOMA TENTA Say.

Two fairly distinct forms of this occur which for the present may be called the southern and northern varieties.

ABRA AEQUALIS Say.

SPISULA (HEMIMACTRA) SOLIDISSIMA Dillwyn.

SPISULA SOLIDISSIMA SIMILIS Say.

SPISULA SOLIDISSIMA RAVENELI Conrad.

MULINIA LATERALIS Say.

LABIOSA (RAETA) CANALICULATA Say.

LYONSIA HYALINA Conrad.

CORBULA CONTRACTA Say.

MYA ARENARIA Linnaeus.

ENSIS MINOR Dall.

PHOLAS (BARNEA) COSTATUS Linnaeus.

TORNATINA CANALICULATA Say.

CYLICHNELLA BIPLICATA H. C. Lee.

Not *C. bidentata* Orbigny, generally accepted as synonomous.

TEREBRA CONCAVA Say.

TEREBRA DISLOCATA Say.

CLATHURELLA JEWETTI Stearns (typical).

MANGILIA, CERINA Kurtz and Stimpson.

MANGILIA, species.

A single specimen of what will probably prove to be a new species was found on the beach at Assateague Bight. This shell is too worn to be properly described.

MARGINELLA APICINA BOREALIS Verrill.

FULGUR PERVERSA Linnaeus.

Very young specimens only.

FULGUR CARICA Linnaeus.

SYCOTYPUS CANALICULATUS Say.

TRITIA TRIVITTATA Say.

NASSA OBSOLETA Say.

NASSA VIBEX Say.

Exceptionally large race.

COLUMBELLA (ANACHIS) AVARA Say (typical).

Large, solid, dingy colored, with 10 to 12 prominent ribs.

COLUMBELLA (ASTYRIS) LUNATA Say.

Specimens from the same haul of the dredge vary greatly in color patterns from light with dark maculations to dark with light maculations to solid reddish brown; the latter is suggestive of Stimpson's

C. dissimilis. It seems useless to attempt any divisions into subspecies based upon color characters only.

EUPLEURA CAUDATA Say.

Exceptionally large.

UROSALPINX CINEREUS Say.

The enormous size of our specimens taken from the oyster beds at first led us to suspect a new species. Say's type, however, came from the Maryland shore and is much larger than the shells of this species from either north or south of this region. These, then, are probably typical *cinereus* and specimens from Long Island as well as those from Hatteras south belong to a much smaller race. Some of our shells measure 51.5 mm. long by 26.4 diameter, while the general average is not very much less. A few specimens (dead) dredged in the open sea are of the smaller race generally known to collectors (20.8 mm. long by 11.4 mm).

EPITONIUM VIRGINICUM, new species.

Plate 13, fig. 1.

Shell very small, broadly conic, white. Nuclear whorls 4, well rounded, polished, separated by a strongly impressed suture. Post-nuclear whorls inflated, marked by very slender lamellar, retractive axial ribs, of which 36 occur upon the first, 48 upon the second, and 60 upon the last turn. The spaces between the axial ribs are a little more than twice as wide as the ribs, and are crossed by very fine spiral threads which run up on the sides of the ribs but do not cross their summit. Of these spiral threads about 20 occur between the sutures on the middle whorl. These threads are about one-half as wide as the spaces that separate them, and are a little more closely spaced at the summit than on the middle of the whorls. Suture strongly constricted. Periphery of the last whorl well rounded. Base well rounded, marked by the continuations of the axial ribs, which extend undiminished to the umbilical region, where they approach each other to such an extent that they become almost fused. Aperture very broadly and very regularly oval; outer lip thin, showing the external sculpture within; inner lip appressed to the body whorl, evenly curved; parietal wall covered with a thick yellowish callus.

The type, Cat. No. 252568, U.S.N.M., was dredged at Chincoteague, Virginia. It has a trifle more than three post-nuclear whorls, and measures: Length, 3 mm.; diameter, 1½ mm.

This little gem appears to be a full-grown individual, judging by the slight thickening of the lip.

EPITONIUM SAYANA Dall,

EPITONIUM LINEATA Say,

EPITONIUM MULTISTRIATA Say,

MELANELLA OLEACEA Kurtz and Stimpson="EULIMA OLEACEA" Kurtz and Stimpson.

TURBONILLA (PYRGISCUS) POWHATANI, new species.

Plate 13, fig. 5.

Shell broadly conic, yellowish white. Nuclear whorls decollated. Post-nuclear whorls moderately well rounded, feebly shouldered at the summit, marked by strong, almost vertical axial ribs, of which 22 occur upon the third, 24 upon the fourth, 26 upon the fifth and seventh, and 28 upon the penultimate turn. These ribs are almost as wide as the spaces that separate them. Intercostal spaces crossed by 7 equal and equally spaced, strongly incised spiral lines. Suture strongly marked. Periphery of the last whorl well rounded. Base short, well rounded, marked by the continuations of the axial ribs, which extend to the umbilical chink, and 5 or 6 feebly incised, irregularly spaced spiral lines. Aperture oval; posterior angle acute; outer lip thin, showing the external sculpture within by transmitted light; inner lip somewhat twisted, slightly revolute; parietal wall covered with a moderately thick callus.

The type, Cat. No. 252574, U.S.N.M., was dredged at Chincoteague, Virginia. It has 7½ post-nuclear whorls, and measures: Length, 5 mm.; diameter, 1.8 mm.

TURBONILLA (PYRGISCUS) POCAHONTASAE, new species.

Plate 14, fig. 4.

Shell broadly conic, bluish white. Nuclear whorls 2½, forming a depressed helicoid spire, the axis of which is almost at right angles to the axis of the succeeding turns, in the first of which it is partly immersed. Post-nuclear whorls very slightly rounded, moderately shouldered at the summit, marked by strong, slightly protractive, broad, well rounded, somewhat curved axial ribs, of which 18 occur upon all the whorls. The intercostal spaces are about twice as broad as the axial ribs. They are well rounded and shallow. They are marked by 5 broad spiral grooves and a number of fine incised lines. The space between the summit and the first broad groove is about twice as wide as that between any of the grooves. This space is crossed by 6 fine incised spiral lines, which are not quite equally spaced, the second and third and the fourth and fifth being a little closer to each other than the others. The space between the first broad groove and the second is crossed by a strongly incised fine spiral line, and the space between the third and fourth is likewise crossed by a fine incised line. Suture well impressed. Periphery of the last whorl feebly angulated, marking the termination of the axial ribs. Base very short, well rounded, marked by 19 well-incised fine spiral lines, which grow successively closer spaced from the periphery to the umbilical area. Aperture subquadrate; posterior angle obtuse; outer lip thin, showing the external sculpture within;

inner lip almost vertical, slightly revolute; parietal wall glazed with a thin callus.

The type, Cat. No. 252575 U.S.N.M., was dredged at Chincoteague, Virginia. It has 10 post-nuclear whorls, and measures: Length, 5.7 mm.; diameter, 1.8 mm.

TURBONILLA (PYRGISCUS) TOYATANI, new species.

Plate 14, fig. 5.

Shell broadly conic, wax yellow. Nuclear whorls decollated. Postnuclear whorls appressed at the summit, marked by almost vertical axial ribs, which are about two-thirds as broad as the spaces that separate them. Of these ribs 22 occur upon all but the last turn, which has 24. Intercostal spaces marked by 6 equal and equally spaced, rather broad, deeply incised spiral lines, the first of which is about 1½ times as far anterior to the summit of the whorls as it is separated from the second, and three very fine lines. Two of these fine spiral lines occur between the summit and the first deeply incised line, while the third occurs halfway between the first and second deep spirals. Suture well marked. Periphery of the last whorl feebly angulated, marking the termination of the axial ribs, which become evanescent here. Base moderately long, well rounded, marked by 13 incised spiral lines of somewhat varying strength and irregular distribution. The space between the first of these lines and the first line of pits on the spire is wider than any of the spaces between the strongly incised lines of the spire. Aperture ovate; posterior angle acute; outer lip thin, showing the external sculpture within; inner lip oblique, slightly curved, and somewhat reflected; parietal wall covered with a thin callus.

The type, Cat. No. 252572, U.S.N.M., was dredged at Chincoteague, Virginia. It has 10 post-nuclear whorls, and measures: Length, 5.3 mm.; diameter, 1.5 mm.

TURBONILLA (PYRGISCUS) VIRGINICA, new species.

Plate 13, fig. 4.

Shell elongate-conic, wax yellow with a darker golden yellow band, which occupies the space bounded by the third and fourth incised spiral grooves. Nuclear whorls decollated, the 3 succeeding badly worn, the remainder well rounded, ornamented with retractive, rounded, moderately strong, axial ribs, which are about two-thirds as broad as the spaces that separate them. Of these ribs 22 occur upon the fourth and fifth, 26 upon the sixth, and 28 upon the penultimate whorl. In addition to the axial sculpture, the whorls are marked by 5 equal and almost equally spaced, strongly incised spiral lines, the first one of which is at a little greater distance below the summit than the space which separates the first and second incised lines. The space between the summit and the first incised line is crossed by 3 very fine equal and equally spaced spiral striations. The incised lines pass up on the sides of the ribs but do not cross the summit. In addition to the above sculpture, the entire surface of the shell is marked with microscopic lines of growth and spiral striations. Suture strongly impressed. Periphery of the last whorl well rounded. Base moderately long, well rounded, marked by the continuations of the axial ribs, which disappear shortly after passing the periphery, and 15 incised spiral lines of somewhat varying width. There is a plain band between the fifth spiral line of the spire and the first incised line of the base a little broader than the band at the summit. Aperture ovate; posterior angle acute; outer lip thin, showing the external sculpture within; inner lip thin, somewhat sigmoid, and slightly revolute; parietal wall covered with a thin callus.

The type, Cat. No. 252573, U.S.N.M., was dredged at Chincoteague, Virginia. It has 8 post-nuclear whorls, having lost the nucleus and probably the first post-nuclear turn, and measures: Length, 4.2 mm.; diameter, 1.4 mm.

Another specimen, in not quite as good condition as the type, has 9 post-nuclear whorls, and measures: Length, 6.2 mm.; diameter, 1.7 mm.

TURBONILLA (PYRGISCUS), species?

A specimen apparently of an undescribed species, but too poor to serve for description.

TURBONILLA (PYRGISCUS), species?

The above remarks apply also here.

ODOSTOMIA (CHRYSALLIDA) TOYATANI, new species.

Plate 13, fig. 2.

Shell small, elongate-ovate, bluish white. Nuclear whorls obliquely immersed in the first of the succeeding turns, above which only half of the last volution projects. Post-nuclear whorls feebly rounded, shouldered at the summit, marked by somewhat retractive axial ribs, which are about as broad as the spaces that separate them. Of these ribs, 20 occur upon the first, 22 upon the second and third, and 24 upon the last turn. In addition to the axial ribs, the whorls are crossed by 4 spiral cords which equal the axial ribs in strength and render the junction of the axial ribs and the spiral cords nodulous. The first of these cords is at the summit, and the fourth bounds the peripheral sulcus. The spaces inclosed between the axial ribs and the spiral cords are strongly impressed, rectangular pits, having the long axis parallel with the spiral sculpture. Suture channeled. Periphery of the last whorl marked by a strong sulcus. Base moderately long, slightly umbilicated, marked by 9 spiral cords, which diminish regularly in size from the peripheral sulcus to the umbilical region. Aperture oval; posterior angle acute; outer lip thin, showing the external sculpture within; inner lip curved and somewhat revolute, adnate posteriorly to the base; parietal wall glazed with a moderately thick callus.

The two specimens of this species, Cat. No. 252578, U.S.N.M., were dredged at Chincoteague Bay, Virginia. One of these, the type, has 5 postnuclear whorls, and measure: Length, 2.2 mm.; diameter, 1 mm.

ODOSTOMIA (CHRYSALLIDA), species?

A specimen which we are unable to refer to any of the known forms, but which is too poor to serve as type for a new species.

ODOSTOMIA (MENESTHO) IMPRESSA Say.

Two specimens.

ODOSTOMIA (EVALEA) VIRGINICA, new species.

Plate 13, fig. 3.

Shell small, elongate-conic, bluish white, with a narrow pale yellow band a little anterior to the summit. Nuclear whorls decidedly obliquely immersed in the first of the succeeding turns, above which the tilted edge of the last volution only projects. Post-nuclear whorls moderately well rounded, weakly shouldered at the summit, marked by decidedly retractive lines of growth and exceedingly fine spiral striations. A slender spiral thread is situated a little posterior to the suture, forming a slight angulation from which the whorls bend a little more abruptly to the inferior tuture. Suture strongly impressed, base of the last whorl moderately long, somewhat inflated, strongly rounded and openly umbilicated. Aperture oval; posterior angle obtuse; outer lip thin; inner lip decidedly oblique, curved and somewhat revolute; parietal wall glazed with a thin callus.

The type and 4 specimens were dredged at Chincoteague, Virginia.

The type, Cat. No. 252576, U.S.N.M., has 6 post-nuclear whorls and measures: Length, 2.7 mm.; diameter, 1.2 mm.

ODOSTOMIA (EVALEA) POCAHONTASAE, new species.

Plate 13, fig. 6.

Shell small, quite regularly conic, semitranslucent, bluish white, with a narrow pale yellow band a little anterior to the summit. Nuclear whorls obliquely immersed in the first of the succeeding turns, above which the titled edge of the last volution only projects. Post-nuclear whorls flattened, feebly shouldered at the summit, the sides of the succeeding turns forming a perfectly straight line, marked by exceedingly fine protractive lines of growth, and microscopic spiral striations only. Suture rendered slightly channeled by the weak shoulder at the summit of the whorls. Periphery of the last whorl decidedly angulated. Base short, well rounded, narrowly umbilicated, marked by lines of growth and fine spiral striations. Aperture ovate; posterior angle acute; outer lip thin; inner lip slightly curved and somewhat revolute, provided with a strong, oblique fold at its posterior extremity; parietal wall glazed with a thin callus.

The type, Cat. No. 252577, U.S.N.M., has 7 post-nuclear whorls and measures: Length, 2.4 mm.; diameter, 1 mm., and it was dredged at Chincoteague Bay, Virginia.

TRIPHORIS PYRRHA, new species.

Plate 14, fig. 1.

Shell broadly conic, white. Nuclear whorls 4, the first half of the first turn smooth, the rest marked by 2 spiral cords and numerous very fine axial threads. Post-nuclear whorls well rounded, the first 4 marked with 2 tuberculated spiral cords, of which one is immediately below the summit and the other a little posterior to the periphery. Beginning with the fifth whorl a third spiral thread makes its appearance between the two, and on the last turn attains a size equal to the one posterior to the periphery. In addition to the spiral cords, weak axial riblets are present, which render the spiral cords tuberculated, 16 tubercles appearing on the first and second whorl, 18 upon the third and fourth, 20 upon the remaining. Suture somewhat channeled. Periphery of the last whorl marked by a strong spiral cord, which is separated from the supraperipheral spiral cord by a sulcus as wide as that which separates the supraperipheral cord from the median. This sulcus is crossed by the continuations of the axial riblets, which stop at its posterior margin. Base moderately produced, marked by two spiral cords, one at the insertion of the columella and the other halfway between this and the peripheral cord. Aperture irregular, decidedly channeled anteriorly (outer lip fractured, thin); inner lip appressed to the base, and fused with the heavy callus which covers the parietal wall and renders the peritreme complete.

The type, Cat. No. 252571, U.S.N.M., was dredged at Chincoteague. It has 7 post-nuclear whorls, and measures: Length, 2.7 mm.; diameter, 0.9 mm.

TRIPHORIS NIGROCINCTA C. B. Adams.

DIASTOMA VIRGINICA, new species.

Plate 14, fig. 3.

Shell elongate-conic. The early whorls are chestnut brown, the succeeding turns flesh colored, mottled and variegated with brown; in some specimens the chestnut brown extends over the entire shell. Nuclear whorls two and one-half, well rounded, smooth. The first 3 post-nuclear whorls rather well rounded; the succeeding turns less so, while the later ones are almost flat. The whorls are marked with poorly developed axial ribs which are almost obsolete on the early turns, where they are merely indicated. Of these ribs, 14 occur upon the third and fourth, 16 upon the fifth, 18 upon the sixth, and 20 upon the remaining turns. The intercostal spaces are fully twice as broad as the ribs, and are crossed by 4 low spiral bands between the sutures, which are a little wider than the spaces that separate them, rendering the axial ribs feebly nodulous at the junction with the ribs. On the last 2 turns the second spiral cord below the summit splits, thus forming 5 spiral cords on these whorls. Beginning with the fifth whorl the cord anterior to the periphery makes its appearance in the suture as a small spiral band, becoming more and more exposed in the succeeding turns. The spaces inclosed between the the axial ribs and the spiral cords are shallow, impressed, squarish pits on the middle whorls, and elongate pits having their long diameter parallel with the spiral sculpture, on the early turns and the last 2 whorls. Suture moderately impressed. Periphery of the last whorl well rounded. Base moderately long, well rounded, marked by the feeble continuations of the axial ribs and 9 spiral cords, which grow successively narrower from the periphery to the umbilical area. These cords are separated by grooves about half as wide as the cords. A strong varix, forming a decided callus, is present diametrically opposite the aperture on the last turn. The spiral cords, preceding and extending partly upon this callus, are tinged with dark chestnut brown. Aperture decidedly patulus, ear shaped, slightly channeled posteriorly and decidedly anteriorly; outer lip thin, decidedly expanded, evenly rounded, flesh colored with a checkerboard pattern of brown, when viewed by transmitted light, which is formed by squarish brown spots marking the intercostal portion of the spiral cords; inner lip reflected, somewhat sigmoid; parietal wall covered by a thick callus, rendering the peritreme complete.

The type, Cat. No. 252569, U.S.N.M., and about 2,000 specimens were collected on the eel grass at Chincoteague Bay. The type has 11 whorls, and measures: Length, 8.3 mm.; diameter at the aperture, 3 mm.; and 2.2 mm. at the antepenultimate whorl.

There are several species of Diastoma tied up under the names of *Bittium nigrum* Totten, and *Diastoma varium* Pfeiffer. It would be out of place in the present paper to discuss this subject at length, as it is to be dealt with shortly in a forthcoming monograph upon these small shells by Dr. Paul Bartsch, in which the synonymy as well as the systematic relationship of these shells will be completely discussed. The present species is more nearly related to *Diastoma varium* Pfeiffer, a truly West Indian species, than it is to the mollusk which has been known to us under that name from the shores of the South Atlantic States.

CERITHIOPSIS (CERITHIOPSIS) VIRGINICA, new species.

Plate 14, fig. 2.

Shell minute, dark chestnut brown, except the apex, which is yellowish white. Nuclear whorls 4, well rounded, smooth. Post-nuclear whorls well rounded, marked by strong axial ribs, of which 16 occur upon all the whorls but the last, which has 18. In addition to the axial ribs, the whorls are marked by 3 strong spiral cords of which the first, which is a little less strong than the rest, is at the summit. The junctions of the axial ribs and the spiral cords form strong tubercles, which are slightly elongate on the first two cords below the summit, while on the last cord they are truncated posteriorly, sloping gently anteriorly. The spaces inclosed between the spiral cords and the axial ribs are rectangular pits on all the whorls but the last; on which they are well rounded. Suture strongly constricted. Periphery of the last whorl marked by a strong somewhat flattened keel, to which the axial ribs extend. Base moderately produced, marked by two spiral cords, one at the insertion of the columella, and another halfway between this and the peripheral cord. Aperture irregular, decidedly channeled anteriorly; posterior angle acute; outer lip thin, showing the external sculpture within.

The type, Cat. No. 252570, U.S.N.M., was dredged on eel grass in the Bay at Chincoteague, Virginia. It has 6 post-nuclear whorls, and measures: Length, 2.9 mm.; diameter, 1 mm.

LITTORINA IRRORATA Say.

CREPIDULA FORNICATA Linnaeus.

CREPIDULA CONVEXA Say.

CREPIDULA PLANA Say.

NATICA PUSILLA Say.

POLYNICES HEROS Say.

POLYNICES DUPLICATA Say.

SIGARETUS PERSPECTIVUS Say.

FISSURELLA ALTERNATA Say.

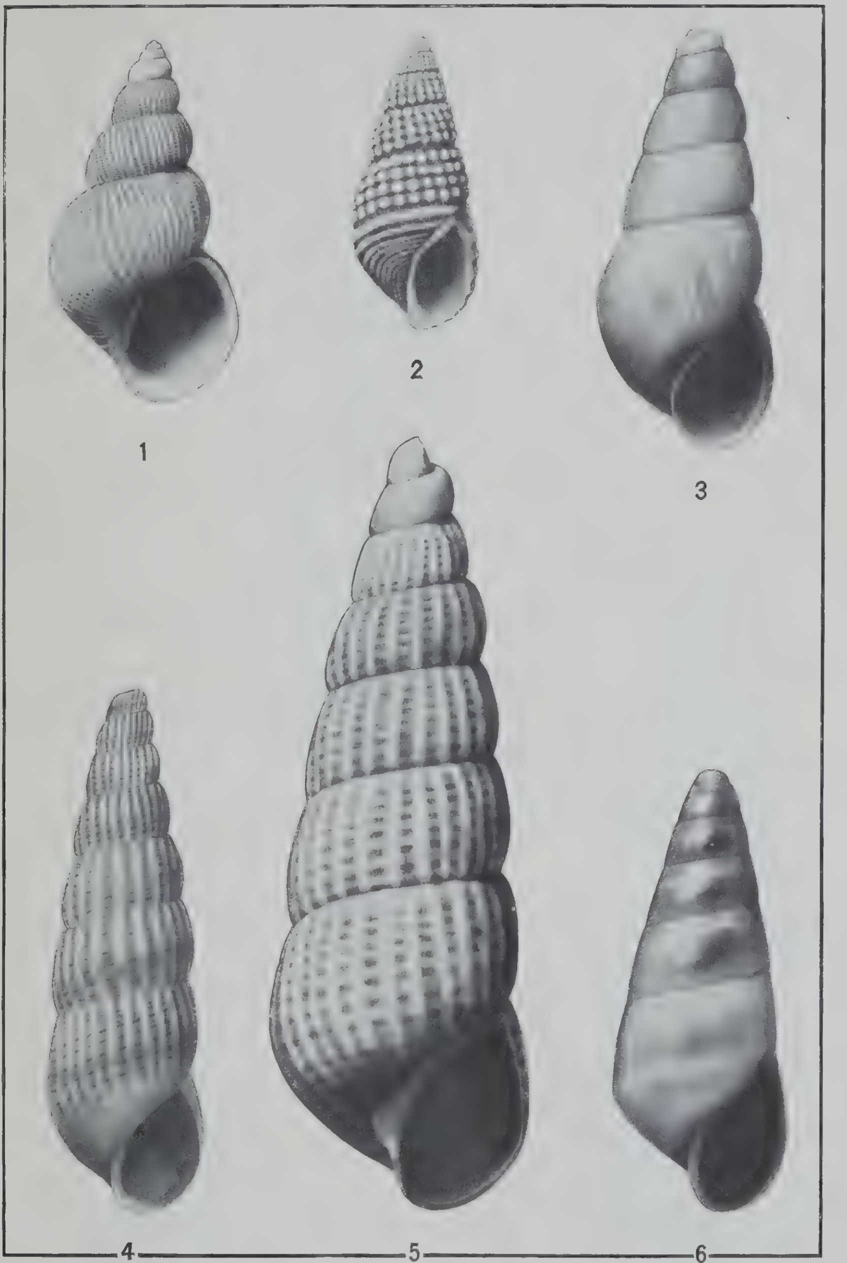
EXPLANATION OF PLATES.

PLATE 13.

Fig. 1. *Epitonium virginicum*, new species, type 3 mm.
2. *Odostomia* (*Chrysallida*) *toyatani*, new species, type 2.2 mm.
3. *Odostomia* (*Evalea*) *virginica*, new species, type 2.7 mm.
4. *Turbonilla* (*Pyrgiscus*) *virginica*, new species, type 4.2 mm.
5. *Turbonilla* (*Pyrgiscus*) *powhatani*, new species, type 5 mm.
6. *Odostomia* (*Evalea*) *pocahontasae*, new species, type 2.4 mm.

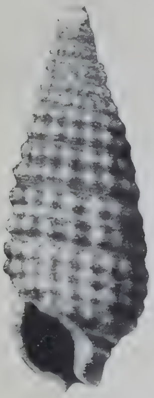
PLATE 14.

Fig. 1. *Triphoris pyrrha*, new species, type 2.7 mm.
2. *Cerithiopsis* (*Cerithiopsis*) *virginica*, new species, type 2.9 mm.
3. *Diastoma virginica*, new species, type 8.3 mm.
4. *Turbonilla* (*Pyrgiscus*) *pocahontasae*, new species, type 5.7 mm.
5. *Turbonilla* (*Pyrgiscus*) *toyatani*, new species, type 5.3 mm.



Mollusks of Chincoteague, Va.

For explanation of plate see page 421.



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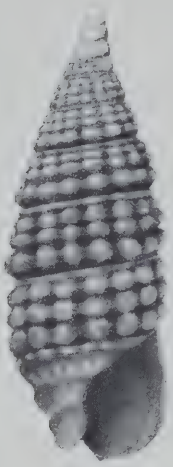

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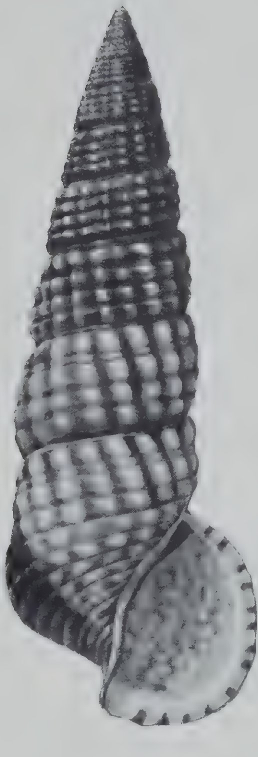

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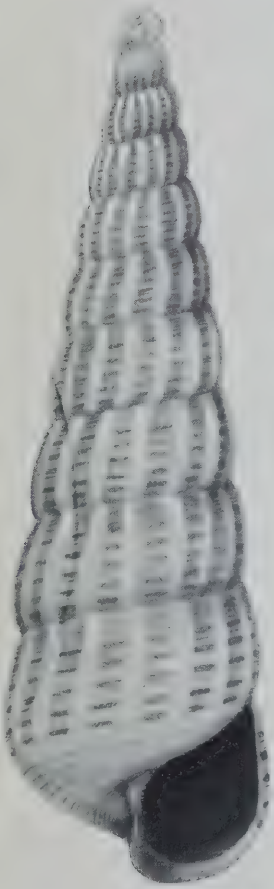

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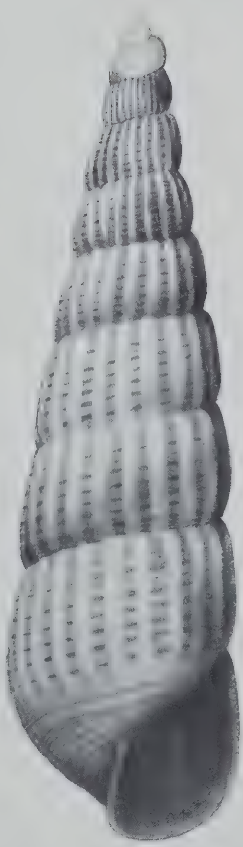

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Mollusks of Chincoteague, Va.

For explanation of plate see page 421.

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Reprinted from *University of Colorado Studies*, Vol. IV, No. 2,
Boulder, Colo., February, 1907.

THE MOLLUSCA OF COLORADO.[1] PART I

By Junius Henderson

When the writer began the study of the molluscan fauna of Colorado a few years ago, the fact that most emphatically and persistently presented itself was the almost total lack of interest in and knowledge of the subject among the biologists of the state. A few conchologists had visited our mountain regions, but the great plains area was untouched except for the visit of Mr. Simpson to the extreme northeastern corner of the state. In response to requests for information, directed to the teachers of various branches of natural history in our public schools and other institutions of learning, it was not at all encouraging constantly to receive the reply that there are no mollusks (or "shell-fish," in popular parlance) in Colorado. However, a few teachers and laymen were found who were sufficiently interested to have collected shells in a modest way and some faithful friends promised to help the work along—promises which have been fulfilled—for such work, to be effective, must be co-operative. If this paper does nothing more than convince teachers and the general public that we have in all parts of the state an interesting and much neglected fauna, it will be worth while.

In addition to this lack of interest, another great difficulty and one which may never be wholly overcome, has arisen from doubts as to the accuracy of identification in many instances in the early reports, some of which doubts cannot now be cleared up. The matter was further complicated by the confusion of species new to science with species theretofore described. The fact that the records are scattered through publications not available in small libraries and that the literature of the subject is in other respects unsatisfactory, tended to discourage local naturalists from undertaking the work which we now feel should be no longer delayed.

A number of lists of Colorado mollusks were long ago published as a result of the efforts of a few collectors, as shown by the bibliography accompanying this sketch, but none of them were at all complete. Ingersoll, with the Hayden Survey, Yarrow with the Wheeler Survey and Cockerell working independently were among the early collectors, the latter still continuing his interest, in connection with other branches of natural history.

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[1] This paper will be followed by one treating the Gastropods.

In view of the abundance of Mollusca in almost every pond, lake, stream, and water-hole of the plains, to find so few published records from the eastern half of the state and that some of our most abundant and two of our largest shells are wholly unrecorded was somewhat surprising. It is worthy of especial note that in the plains area almost our only records of fresh-water species, except the few from Lodge Pole Creek and Ft. Morgan, are confined to the area west of a line drawn from Pueblo to Crow Creek, while about the only land snails reported from east of that line are the *Succinea* collected at Mono, on the eastern boundary of the state. The reason is that local naturalists are not generally interested in conchology and visiting conchologists are usually in haste to reach the mountains.

There is perhaps no part of the state in which a careful search would not reveal both land and fresh-water shells containing the living animals. This paper does not deal with fossil forms except incidentally. The land snails are with a few exceptions quite small, the principal exception being the genus *Oreohelix*. This may account for the fact that they are not well known to teachers of zoology or to the general public. The fresh-water snails average much larger, the *Limnœas* of some species reaching a length of an inch and a half, while several bivalve species reach a length of over three inches. Both land and fresh-water shells are found from the valleys nearly to the top of the range. Almost every pond, lake, or stream will yield some of the latter, while the former may be expected anywhere in damp places under rocks, boards, dead leaves, etc. Generally speaking, they are not apt to be found under resinous trees or among pine needles, but they may sometimes be found even among the pines, in places where there are also quaking aspens and other desiduous trees.[1]

Colorado, because of its great variation in altitude, temperature, humidity, and other conditions, and because of the mountains and other supposed barriers, is considered an important field for extensive and intensive collecting and study of mollusks. Up to the present time the study of the influence of altitude upon mollusks in this region has given chiefly negative results. Instead of dwarfing the species as in Montana and other regions where the cold of high altitudes is more intense,[1] the higher altitudes seem more favorable to land snails than lower levels, because of increased humidity. The finest specimens of *Oreohelix strigosa* and *Vitrina alaskana* found have been at 11,000 and 9,300 feet respectively. Ingersoll[2] reports the same fact concerning *Thysanophora* (*Microphysa*). On the other hand, the larger fresh-water snails we have found do not occur in the lakes at timber line at all. Among bivalves we have found *Pisidia* at 11,000 feet, *Calyculina* at 8,500 feet, but no *Unionidæ* at all in the mountains or anywhere in the western half of the state. The only thick-shelled *Unionidæ* found in the state are those from Lodge Pole Creek and Las Animas County, though a thin-shelled species (*Strophitus edentulus pavonius*) is found close to the foothills.

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[1] Compare V. STERKI, "Shells in Pine Forests," *The Nautilus*, Vol. V 1891–92, p. 118.

The majority of our species, both land and fresh water, are also found in the Mississippi Valley and eastward, probably having reached Colorado from the eastward or northward, but, on the other hand, there is an impressive and probably significant absence of such genera as *Polygyra*, *Campeloma*, *Viviparus*, *Goniobasis* and *Pleurocera*, which are so well represented in the eastern states. The distribution of *Oreohelix* and *Thysanophora* indicates that they have crossed the mountains from the westward; but if so, the former must have arrived at the base of the foothills long ago, as suggested by fossil specimens in the Quaternary deposits. *Viviparus*, *Campeloma* and *Goniobasis* lived in northeastern Colorado, together with *Anodonta*, *Unio*, and *Physa*, during the latter part of Cretaceous time, as shown by the Laramie fossils of Crow Creek and neighboring localities, but the three first-named genera have disappeared from the state, while *Physa* is among our most abundant mollusks at the present time. *Anodonta* is reported from Lodge Pole Creek, its near relative *Strophitus* is our most common large bivalve, and *Unio* has been found in two localities. *Lymnæa*, *Planorbis*, and *Unio* occur in Jurassic strata near Canyon City, but, owing to the absence of fresh-water beds from most of the Cretaceous formations, they are not found between the Jurassic and Laramie. The Jurassic *Unios* are not of distinctively North American type. *Omphalina?*, *Lymnæa*, *Planorbis* and *Sphærium* are found in the Tertiary lake beds of Florissant.[4] The three last-named genera are still represented in the state by living species.

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[1] MORTON J. ELROD, *Bull. Univ. Mont.*, No. 17, p. 259.

[2] *Eighth Ann. Rept. Hayden Survey*, p. 398.

This attempt to incorporate into one paper the published records of our Mollusca, together with new records based upon recent collections, must necessarily be more or less incomplete and in some respects inaccurate, because of the present unsatisfactory *status* of some nominal western species, the impossibility of now certainly determining the accuracy of identification of early collections and the inaccessibility of some important publications which might furnish further records or other information. However, it is hoped that this bringing-together in brief form of the numerous records must at least greatly aid in future investigations, and afford a fresh starting-point from which our molluscan fauna may be attacked with renewed vigor, besides presenting the additional records for the first time given to the public. It is quite possible that some published records have been overlooked.

The writer is very grateful to Dr. Henry A. Pilsbry and Mr. E. G. Vanatta, of the Academy of Natural Sciences of Philadelphia; Dr. Paul Bartsch, of the U. S. National Museum; Mr. Frank C. Baker, of the Chicago Academy of Sciences; Dr. V. Sterki, of New Philadelphia, Ohio; Professor T. D. A. Cockerell, of the University of Colorado; Mr. Chas. T. Simpson, of Lemon City, Florida; and Mr. Bryant Walker, of Detroit, Michigan, for their kindly assistance in the identification of difficult material, for reading and revising portions of the manuscript, for additional records they have furnished and for many suggestions for the improvement of the paper in various ways; also to those whose names are mentioned in the catalogue for the collections they have so kindly brought in from various parts of the state. The records from Mr. Vanatta's manuscript are based upon specimens in the collection of the Academy of Natural Sciences of Philadelphia. Further collections, data, suggestions, or corrections are invited from any who are interested in the subject, in order that errors may be corrected or omissions supplied in a supplemental paper if deemed advisable.

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[4] COCKERELL, "The Fossil Mollusca of Florissant, Colorado," *Bull. Amer. Mus. Nat. Hist.*, Vol. XXII, Art. XXVII, pp. 459–462, 1906.

In the catalogue the figures in bold-faced type indicate the numbers of the several publications in the bibliography, the light-faced figures indicating the pages. The illustrations, except Plates I and II, are electrotyped from originals used in publications of the Smithsonian Institution, by courtesy of the authorities of that institution.

The following species and subspecies are herein recorded for the first time from this state, so far as we have ascertained: *Strophitus edentulus pavonius*, *Unio tetralasmus camptodon*, *Calyculina securis*, *Pisidium noveboracense*, *P. compressum*, *Oreohelix strigosa albofasciata*, *O. haydeni*, *Pupilla sonorana*, *Bifidaria armifera*, *Vertigo ventricosa elatior*, *Vallonia gracilicosta*, *Helicodiscus eigenmanni arizonensis*, *Succinea salleana*, *S. haydeni*, *Lymnæa bulimoides techella*, *L. caperata*, *Planorbis exacuous*, *Ancylus caurinus*, *Physa integer*, *P. anatina*, *P. lordi*, *P. hawnii?*.

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List of Localities

[In order to avoid designating the portion of the state in which the various stations are located in each instance, this table is presented]

Animas Valley, La Plata Co.
Ault, Weld Co.
Baker's Park, Mineral Co.
Bear Canyon, Boulder Co.
Black Lake, Summit Co.
Black Lake Creek, Summit Co.
Blue River, Summit Co.
Boulder, Boulder Co.
Buzzard Creek, Mesa Co.
Canyon City, Fremont Co.
Carrizo Creek, Las Animas Co.
Cattle Creek, Garfield Co.
Chalk Creek, Chaffee Co.
Clear Water Creek, Mesa Co.
Clear Creek, Mineral Co.
Cottonwood Gulch, Saguache Co.
Cotapaxi, Fremont Co.
Craig, Routt Co.
Crow Creek, Weld Co.
Cunningham Gulch, San Juan Co.
Davidson's Ranch, Boulder Co.
Del Norte, Rio Grand Co.

Dillon, Summit Co.
Divide Creek, Garfield Co.
Eagle River, Eagle Co.
Egeria, Routt Co.
Eldora, Boulder Co.
Empire, Clear Creek Co.
Estes Park, Larimer Co.
Fairplay, Park Co.
Florence, Fremont Co.
Florissant, Teller Co.
Ft. Collins, Larimer Co.
Gault, Weld Co.
Gleneyre, Laramie Co.
Glenwood Springs, Garfield Co.
Granby, Larimer Co., N. of Grand Lake.
Grand Mesa, Mesa Co.
Greeley, Weld Co.
Hardscrabble Canyon, Custer Co.
Horseshoe Bend Gulch, Custer Co.
Hot Sulphur Springs, Grand Co.
Howardsville, San Juan Co.
Hygiene, Boulder Co.
Kremmling, Grand Co.
Lake George, W. of Florissant.
Lake of the Clouds, Custer Co.
Little Blue Creek Gunnison Co.
Lodge Pole Creek, Logan Co.
Los Pinos River, La Plata Co.
Lyons, Boulder Co.
Micawber Mine, Custer Co.
Magnolia, Boulder Co.
Mam Mts., Mesa Co.
Meeker, Rio Blanco Co.
Mineral Creek, Mineral Co.
Monon, Baca Co.
Muddy Creek, Grand Co.
Naomi, Summit Co.
Northrop, Chaffee Co.
North Mam Creek, Garfield Co.
Owen's Lake, Boulder Co.
Plateau Creek, Mesa Co.
Pottery Pass, Summit Co.
Powderhorn, Gunnison Co.
Red Cliff, Eagle Co.
Rio La Plata, La Plata Co.
Roaring Fork, Garfield Co.
Rock Creek, Routt Co.
Round Mt., Custer Co.
Saguache Creek, Saguache Co.
Salida, Chaffee Co.
St. Mary's Lake, Mineral Co.
St. Vrain Canyon, Boulder Co.
Short Creek, Custer Co.
Slate Creek, Summit Co.
Squaw Creek, Eagle Co.
Straight Creek, Summit Co.
Surface Creek, Delta Co.
Swift Creek, Custer Co.
Twin Lakes, Lake Co.
Twin Mesa, Gunnison Co.
Two Elk Creek, Eagle Co.
Wales Canyon, Pueblo Co.
Ward, Boulder Co.
Wellsville, Custer Co.
West Cliff, Custer Co.
West Ten Mile Creek, Summit Co.
Wet Mt. Valley, Custer Co.
Wheeler, Summit Co.
White Earth Creek, Gunnison Co.
Williams Canyon, El Paso Co.
Willow Creek, Custer Co.
Windsor, Weld Co.
Zion Peak, Lake Co.

Systematic Table of Colorado Molluscan Genera

CLASS PELECYPODA (*Bivalves*)

Order Prionodesmacea
Superfamily Naiadacea
Family Unionidæ
Genera *Anodonta*, 1 sp.
Strophitus, 1 sp.
Anodontoides, 1 sp.
Lampsilis, 3 sp.
Unio, 1 sp.

- Order Teleodesmacea
  - Superfamily Cyrenacea
    - Family Sphæriidæ
      - Genera *Sphærium*, 4 sp.
      - *Calyculina*, 3 sp.
      - *Pisidium*, 5 sp.

CLASS GASTROPODA (*Univalves*)

Subclass ANISOPLEURA

- Superorder Euthyneura
  - Order Pulmonata
    - Suborder Stylommatophora
      - Family Helicidæ
        - Genera *Oreohelix*, 3 sp. and var.
        - *Thysanophora*, 1 sp.
        - *Polygyra*, 1 sp.
      - Family Pupillidæ
        - Genera *Pupoides*, 2 sp.
        - *Pupilla*, 3 sp.
        - *Bifidaria*, 2 sp.
        - *Vertigo*, 7 sp. & va.
      - Family Achatinidæ
        - Genus *Cochlicopa*, 1 sp.
      - Family Valloniidæ
        - Genus *Vallonia*, 3 sp.
      - Family Zonitidæ
        - Genera *Vitrina*, 1 sp.
        - *Vitrea*, 1 sp.
        - *Euconulus*, 1 sp.
        - *Zonitoides*, 3 sp.
      - Family Limacidæ
        - Genus *Agriolimax*, 2 sp.
      - Family Endodontidæ
        - Genera *Pyramidula*, 2 sp.
        - *Helicodiscus*, 2 sp.
        - *Punctum*, 1 sp.
        - *Sphyradium*, 1 sp.
      - Family Succineidæ
        - Genus *Succinea*, 8 sp.
    - Suborder Basommatophora
      - Family Limnæidæ
        - Genera *Limnæa*, 12 sp. and var
        - *Planorbis*, 5 sp.
      - Family Ancylidæ
        - Genus *Ancylus*, 3 sp.
      - Family Physidæ
        - Genera *Physa*, 11 sp.
        - *Aplexa*, 1 sp.

Superorder Streptoneura
    Order Ctenobranchiata
        Suborder Streptodonta
            Family Valvatidæ
                Genus *Valvata*, 1 sp.

KEY TO COLORADO MOLLUSCA

Inherent difficulties in the description of shells make it almost impossible to formulate a key which is sufficient of itself for the identification of species, but this key may be of assistance to students, who, however, must in the end, depend upon more extended descriptions, in other works. The great majority of our species are described in Baker's *Mollusca of the Chicago Area*, published by the Chicago Academy of Sciences; Binney's "A Manual of American Land Shells," *Bulletin No. 28* of the *United States National Museum*, Binney, Bland and Tryon's "Land and Fresh-Water Shells of North America," Parts I, II, III, and IV, *Smithsonian Miscellaneous Collections*, Nos. 143, 144, 194, and 253, respectively; Prime's "Monograph of American Corbiculidæ." *Smithsonian Miscellaneous Collections*, No. 145.

PELECYPODA (Bivalves)

A. Shell more than 2 inches in length, lateral teeth posterior to cardinal teeth.
  a. Rather thin shelled, cardinal teeth slightly or not at all developed.
    1. Coarse wrinkles on beaks in parallel double loop. **Anodonta grandis giganteus**
    2. Coarse parallel wrinkles on beaks, not doubly looped. **Strophitus edentulus pavonius**
    3. In addition to coarse wrinkles, fine ridges on umbones, directed posteriorly. **Anodontoides ferussacianus**
  b. Shell solid, cardinal teeth well developed.
    1. Length about twice the height or more.
      aa. Beak wrinkles 5 to 7, in long poorly defined double loop, cardinal teeth double in both valves. **Lampsilis anodontoides**
      bb. Umbones with about 14 fine undulating ridges. **Lampsilis luteola**
      cc. Umbones with 5 to 8 coarse concentric ridges. **Unio tetralasmus camptodon**
    2. Length about ½ greater than height, 6 coarse beak wrinkles not doubly looped, cardinal teeth double only in left valve. **Lampsilis ventricosa**

B. Shell less than one inch in length, lateral teeth both anterior and posterior.
  a. Animal with one short siphon; mussel generally small to minute, 1.5 to 8 mm. long, in a few species 8 to 12 mm.; anterior part generally longer than posterior. **Pisidium** spp.
  b. Animal with 2 longer siphons, connate at their bases for a longer or shorter distance; mussel averaging larger, 5 to 20 mm. long; anterior part generally shorter than posterior.
    1. Shell and hinge generally stouter, beaks rarely calyculate (capped). **Sphærium** spp.

2. Shell and hinge very slight, beaks in most species calyculate (with caps). **Calyculina** spp.

(After consultation with our best authorities on these three genera it seems best to omit any attempt to put the species in a key, in the present state of knowledge).

GASTROPODA (Univalves)

* Terrestrial Snails, with Well-developed Shell

A. Height of shell less than width.
  a. Width of adults more than 8 mm.
    1. Lip well reflexed. **Polygyra monodon**
    2. Lip not reflexed, whorls 5, marked by one or more dark spiral bands.
      aa. Depressed, sometimes reaching width of 25 mm. and height of 10 mm. **Oreohelix strigosa**
      bb. Smaller with same number of whorls, width 16 mm., height 8 mm., otherwise as *strigosa.* **Oreohelix strigosa concentrata**
      cc. Spire elevated, last whorl descending toward aperture. **Oreohelix strigosa cooperi**
      dd. Similar to *strigosa* but with several riblike revolving lines crossing the lines of growth. **Oreohelix haydeni**
  b. Width less than 8 mm.
    1. Discoidal, apex level with or below top of last whorl.
      aa. Whorls not equally visible above and below, growth lines not crossed by parallel spiral lines, whorls 5 or 6, width 4 mm., height 2.5 mm. **Thysanophora ingersolli**
      bb. Whorls equally visible above and below, growth lines crossed by fine, equidistant, parallel spiral lines, width 3.5 mm., height 1.5 mm. **Helicodiscus parallelus**
      cc. Larger, width 4.5 to 5 mm. **H. eigenmanni arizonensis**
    2. Apex raised more or less above top of last whorl, peristome not everted or reflected.
      aa. Rather depressed.
        1. Thin, brownish horn, smooth, shining, whorls 4, last enlarging very rapidly, width 3.5 to 4 mm. **Vitrea hammonis**
        2. Very fragile, greenish white, transparent, smooth, glassy, whorls 3, last composing most of shell, width 5 mm. **Vitrina alaskana**
        3. Smooth, growth lines fine, requiring a lens, color amber to whitish, whorls 4 or 5, width 5 mm., heighth 3.75 mm., usually smaller. **Zonitoides arboreus**
        4. Minute, spire nearly flat, growth lines strong under lens, color white, width 2.5 mm., height 0.75 mm. **Zonitoides minusculus**
        5. As *minusculus*, except striæ more riblike, interspaces microscopically striate, spire less depressed. **Zonitoides conspectus**

6. Umbilicus wide, exhibiting all volutions from below, striæ riblike, width 5 to 5.75 mm., height 2.5 to 2.75 mm. **Pyramidula cronkhitei anthonyi**

7. Shaped as *anthonyi*, but smoother, irregularly wrinkled or ribbed. **Pyramidula cockerelli**

8. Minute, reddish or brownish, marked by strong striæ and fine spiral lines, strongest on base, width 1 mm., height, 0.5 mm. **Punctum pygmæum**

bb. Elevated, smooth, shining, amber-colored, whorls 6, increasing regularly, umbilicus not perforated or scarcely so, width 2.25 to 3 mm., height 1.75 to 2.75, juveniles easily mistaken for young *Pupa*. **Euconulus trochiformis**

3. Minute, umbilicate, depressed, apex raised above top of last whorl, persistome everted or reflected, light unicolored, width 2 to 2.6 mm., height 1 to 1.3 mm.

aa. Rather solid, shining, not ribbed, growth striæ fine, persistome reflected and white. **Vallonia pulchella**

bb. Solid, striæ stronger and more distinct than in *pulchella* and rather irregular, last whorl expanding and descending toward aperture, peristome reflected and porcelain-white. **Vallonia gracilicosta**

cc. Thin, ribs fine and numerous and bearing membranes which give the ribs of fresh specimens a roughly sharp appearance, last whorl expanding and descending toward aperture, persistome everted but not reflected into a decided lip. **Vallonia cyclophorella**

B. Height of shell greater than width.

a. Aperture very large, peristome simple, shell thin and fragile, imperforate, whorls usually 3, increasing rapidly.

1. Long and narrow.

aa. Aperture long and narrow, exhibiting all volutions within to apex, last whorl more than twice size of others combined, pellucid, color light or greenish horn, growth lines minute, height 15 to 20 mm., width 6.5 to 9 mm. **Succinea retusa**

bb. Aperture but little more than half length of shell, more nearly circular than in *retusa*, color straw or greenish horn, sometimes with a reddish tinge, shining, whorls 3, height 6 to 12 mm., spire sharp, growth lines minute (our specimens all small, about 5 mm). **Succinea avara**

cc. Pale horn or whitish, spire short and acute, coarsely striate, shining, height 20 mm., width 8 mm., aperture 13 mm., long and widest below middle. **Succinea sillimani**

dd. Pale greenish horn-color, striæ coarse and irregular, surface without luster, aperture widest about middle and ¾ the length of shell, height of shell 12 mm., width 6 mm., fold of columella distinct. **Succinea rusticana**

ee. Color dull horn, growth lines rude, aperture about ⅔ length of shell, last whorl constituting nearly whole shell, columella gently curved and without fold, height 13 mm. **Succinea nuttalliana**

ff. Thin, shining, amber-colored, spire short, acute, whorls convex, last marked by growth wrinkles, light callus on columella, aperture $\frac{5}{7}$ length of shell, expanding below and exhibiting volutions to apex, height 15 to 21 mm., width 7 to 9 mm. **Succinea haydeni**

gg. Whitish horn-colored, pellucid, shining, delicately striate, marked irregularly with impressed spiral lines, aperture oval, angular above, height 18 to 20 mm. **Succinea salleana**

2. Wider in proportion to height.

aa. Whorls full and rounded, growth wrinkles irregular, interspaces often crossed by parallel spiral lines. **Succinea grosvenori**

bb. Similar to *avara* but more compact, shorter in proportion to width. **Succinea stretchiana**

b. Aperture $\frac{1}{3}$ length of shell, shell oval, highly polished, whorls 6, gradually increasing in size, growth lines very fine, peristome simple, length 5.5 to 6 mm., width 2.25 mm., an unmistakable species. **Cochlicopa lubrica**

c. Aperture very small, shell small, spire long in proportion to aperture, generally cylindrical with obtusely rounded apex, whorls numerous, not usually increasing much after the first 2 or 3.

1. Whorls 6 or 7, except *B. pentodon*.

aa. Brownish horn color, shell tapering regularly from body whorl to apex, growth lines fine, base produced, aperture toothless, umbilicus deep and open, persistome reflected, height 5 mm., width 2 mm. **Pupoides marginatus**

bb. Horn color, small, cyclindrical, irregularly ribbed, aperture toothless, peristome narrowly reflected and white, umbilicate, umbilicus bounded by an angle, height 3.5 mm., width 1.6 mm. **Pupoides hordaceus**

cc. Dark chestnut or bay, lower 4 whorls about equal diameter, growth lines fine, aperture usually toothless, umbilicus perforate, persistome somewhat reflected, height 4 mm., width 1.5 mm. **Pupilla muscorum**

dd. Light brown, last whorl ascending and rapidly expanding toward aperture, external callus separated from subreflected peristome by deep constriction, teeth obtuse, 1 parietal, 1 columellar, 1 far within base of aperture, height 3 mm., width 1.5 mm. **Pupilla blandi**

ee. Brownish horn color, cylindrical, whorls gradually increasing, striated rugulose, coarser near aperture, lip abruptly but narrowly everted, teeth white, parietal deep seated, long and spiral, columellar perpendicular along columella, palatal (the inferior) strong often with threadlike prolongation inward, height 2.6 mm., width 1.3 mm. **Pupilla sonorana**

ff. Light horn color, inflated, vitreous, shining, smooth, growth lines crowded, first 3 whorls increasing rapidly, last 3 about equal, 1 single or double parietal lamella, a massive tooth on columellar wall far within, 1 at lower right-hand angle of aperture, 1 above it, sometimes 1 or 2 others, peristome broadly reflected, height 4 to 4.5 mm., width 2.25 mm. **Bifidaria armifera**

gg. Whitish, very small, outline as in *armifera*, whorls 5, 8 teeth, 1 on columella, 3 on base, 3 on inner side of lip, a long one extending downward from parietal wall, peristome slightly reflected, height 2 mm., width about 1 mm. **Bifidaria pentodon**

hh. Chestnut brown, perforate, middle 3 whorls about equal, last expanding toward base, with tendency to separate from penultimate one, peristome simple, slightly reflected over umbilicus. **Sphyradium edentulum**

2. Whorls 5 or less.

aa. Color dark amber, ovate, whorls 5, increasing somewhat regularly and rapidly, last inflated, peristome somewhat expanded, with groove behind and thickened within, umbilicus expanded, 2 parietal teeth, 1 columellar, 2 basal, 1 inside outer margin of aperture, height 3 mm., width 1.5 mm. **Vertigo ovata**

bb. Amber-colored, narrowly ovate, highly polished, whorls 5, one tooth on middle of lower lip, and one on parietal wall, one on columella and a small one within outer lip. **Vertigo tridentata**

cc. Color light chestnut, cylindrical ovate, whorls 4 or 4½, increasing slightly after the second, last about ½ length of shell, umbilicus slightly open, teeth variable, 1 to 3 parietal, 1 columellar, 1 at lower left-hand angle, 2 on oblique base and outer lip, sometimes 1 above and 1 below latter two, peristome thickened but not reflected, width 1 mm. **Vertigo gouldi**

dd. Ovate to oblong ovate, whorls 4, smooth, polished, one parietal tooth, 2 columellar and 2 basal, outer margin of aperture fleunose, peristome reflected. **Vertigo ventricosa elatior**

ee. Shape as in *gouldi*, but last 2 of the 3½ whorls equal, umbilicus distinct, lip reflected, 1 parietal tooth, 1 columellar, 2 well within lip. **Vertigo modesta corpulenta**

ff. Much like *corpulenta*, but usually an additional lamella in variable stages of development in the lower left-hand angle of aperture. **Vertigo modesta parietalis**

gg. Minute, brown, shining, striate, peristome thick and brown, teeth brown, 1 long parietal tooth, 1 columellar, 2 long lamellæ on outer lip, lower one the larger, height 1.5 mm. **Vertigo coloradensis**

hh. Chestnut brown, shining, whorls 5, upper 3 tapering to blunt apex, last ascending toward aperture as in *Pupilla blandi*, 1 short entering parietal tooth, a smaller one to right and nearer upper angle, a strong entering columellar lamella, 2 long folds within outer lip, lower one the larger, height 2 mm., width 1.1 mm. **Vertigo concinnula**

ii. Very small, color dark chestnut, growth lines minute, angle of convergence toward produced base and blunt apex about equal, whorls 5, 2 projecting parietal teeth, 1 columellar, 1 basal, a long curved one within outer lip, a long entering lamella curving from outer basal angle to behind columella, peristome white, unreflected, umbilicus open, deep, height 1.4 mm., width 0.9 mm. **Vertigo milium**

** Terrestrial Naked Slugs

A. Unicolored, unspotted. **Agriolimax campestris** and var.

B. Darker reticulated lines on lighter ground color giving a spotted appearance. **Agriolimax agrestis**

*** Fresh-Water Snails

A. Discoidal, whorls coiled in one plane.

- *a.* More than 5 mm. in width.
  - 1. Color white to brown, whorls 4, spire flat from above, depressed and showing 2½ to 3 whorls from below, whorls slightly carinate above, width 15 to 20 mm. **Planorbis trivolvis**
  - 2. Distorted form of *trivolvis*, plane of inner whorls inclined to that of outer whorl so that carina of 3d whorl forms a shoulder on right side and sinks beneath outer whorl on left side. **Planorbis plexata**
  - 3. Whorls 3, sharply carinate above and below, conically depressed above and below, smaller than *trivolvis*, V-shaped aperture extending above top of body whorl. **Planorbis bicarinatus**
- *b.* Less than 5 mm. in width.
  - 1. Color bright horn to black, umbilicus wide and shallow, showing all volutions from above and below, apex depressed somewhat below top of last whorl. **Planorbis parvus**
  - 2. Whitish, with deeper, narrower umbilicus than *parvus*, apex not sunken. **Planorbis umbilicatellus**
  - 3. Dark brown, periphery of outer whorl sharply carinate. **Planorbis exacuous**

B. Small, depressed conical, patelliform.

- *a.* Fragile, sides parallel or incurved in middle, apex elevated and curved backward, ⅔ from anterior end of shell, extreme length 4 mm., width 1.1 mm., height 1 mm., usually much smaller. **Ancylus fragilis**
- *b.* Similar to, if not identical with, *fragilis*. **Ancylus caurinus**
- *c.* Pale, thin, delicate, sides nearly straight, not quite parallel, apex sharp, ⅗ from anterior end, turned to right. **Ancylus parallelus**

C. Spire depressed, but apex raised considerably above body whorl, color brownish, shining, whorls 3½, last much deflected, making aperture nearly round and continuous, peristome simple and nearly continuous, easily distinguished from all other Colorado species. **Valvata lewisi**

D. Spire elevated, sinistral.

- *a.* Rather wide in proportion to height, last whorl usually constituting larger part of shell. **Physa** spp.

(Owing to unsatisfactory status of species of this genus it is deemed best not to attempt to differentiate them in this key.)

b. Distinguished from *Physa* by long, narrow form, very highly polished shell and simple mantle margin of animal, spire long, body whorl subcylindrical, height of shell 10 to 18 mm., width 5 to 9 mm. **Aplexa hypnorum**

E. Spire elevated, dextral.

a. Adults under 20 mm. in height, columella without well-marked fold.

aa. Columellar lip not broadly reflected.

1. Rather slender, growth lines numerous with usually some coarser wrinkles, sometimes faceted by a few coarse spiral wrinkles intersecting growth lines, aperture narrow and half the length of shell or more, base rather produced, whorls 5, height 8 to 13 mm. **Lymnæa obrussa**
2. Short spired form of *obrussa* **Lymnæa obrussa modicella**
3. Smaller, spire shorter and less sharp, base less produced than in *obrussa*, whorls 5, height 7 to 9 mm. **Lymnæa humilis**
4. Growth lines fine and numerous, latticed (under lens) by fine, *raised* intersecting spiral lines, whorls 5 or 6, more convex than in *obrussa*, aperture shorter and more nearly circular, height 10 to 15 mm. **Lymnæa caperata**

bb. Columellar lip broadly reflected.

1. More slender than *humilis*, spire longer and more turreted, aperture more regularly elliptical. **Lymnæa parvus**
2. Smooth, shorter than *obrussa* in proportion to height, aperture somewhat longer than *caperata*, growth lines not crossed by spiral raised lines, whorls 5, height 9 mm., width 5 mm. **Lymnæa bulimoides**
3. Spire shorter, form more globose, umbilicus larger than *bulimoides*. **Lymnæa bulimoides cockerelli**
4. Spire acutely conic, whorls 5 or 6, finely striate, usually malleated, facets obliquely descending, umbilicus large, columellar lip very broadly reflected. **Lymnæa bulimoides techella**

b. Adults over 20 mm. in height, with distinct oblique fold across columella.

aa. Very large, whorls 6½, last large and inflated, spreading columellar callus closely appressed, completely covering umbilicus. **Lymnæa stagnalis appressa**

bb. Smaller, whorls 6, last not so large in proportion to spire, columellar callus not entirely covering umbilicus.

1. Growth lines crowded, crossed by numerous fine, incised spiral lines and sometimes several coarse, elevated wrinkles, whorls rather flat, peristome thin, white, with brown band edging callus within. **Lymnæa palustris**
2. Very long spire, whorls flat. **Lymnæa palustris elodes**
3. Body whorl and aperture wider, whorls rounded and somewhat shouldered **Lymnæa sumass**

CATALOGUE OF COLORADO MOLLUSCA

[The references are to publications listed in the preceding bibliography, the figures in bold-faced type indicating the number of the publication in the bibliography, the light-faced figures indicating the page. The published records and synonomy appear first, followed by our new records and occasional comments.]

Genus **ANODONTA** (Bruguiere *Em.*) Lamarck

Anodonta grandis gigantea Lea. Pl. I, fig. 1.

Anodonta plana Lea, collected by Mr. Chas. T. Simpson in Lodge Pole Creek, Cockerell **22,** 61.

We find no other other record. *A. plana* has been since placed in synonomy of *A. g. gigantea,* but the validity of the subspecies may be doubted, in which case this record would stand as *A. grandis* Say.

Genus **STROPHITUS** Rafinesque

Strophitus edentulus pavonius Lea. Pl. I, fig. 2.

Strangely enough, this large species does not appear to have been recorded from Colorado, although it likely occurs in all streams of the plains bordering the mountains at least from Denver northward. We have received specimens collected by Prof. A. E. Beardsley in the Cache la Poudre near Greeley, by Prof. D. W. Spangler in the St. Vrain at Longmont, by Prof. E. Bethel in a lake near Denver and have collected them in the Platte near Evans and in the Crow Creek water-holes, 25 miles northeast of Greeley. Some of Prof. Bethel's specimens reached a length of 140 mm.

Genus **ANODONTOIDES** Simpson

Anodontoides ferrussacianus Lea. Pl. I, fig. 3.

Anodonta ferussaciana, collected by Mr. Simpson in Lodge Pole Creek. Cockerell **22,** 61.

Genus **LAMPSILIS** Rafinesque

Lampsilis ventricosa Barnes. Pl. I, fig. 4.

Unio occidens Lea. Collected by Mr. Simpson in Lodge Pole Creek. Cockerell **22,** 61.

Lampsilis anodontoides Lea. Pl. II, fig. 5.

Unio anodontoides. Lodge Pole Creek, Simpson **48,** 430.

Lampsilis luteola Lam. Pl. II, fig. 6.

Unio luteolus, eastern Colorado, Simpson **47,** 88.

Unio tetralasmus camptodon Say. Pl. II, fig. 7.

Four or five specimens were collected by Prof. A. E. Beardsley, in Carrizo Creek, in 1881, but had never been recorded.

Genus **SPHÆRIUM** Scopoli

Sphærium occidentale Prime.

Pond near Black Lake, Cockerell **22,** 65.

Sphærium hendersoni Sterki. Pl. II, fig. 8.

Crow Creek water-holes, Sterki **61*a*,** 69.

The type-specimens of this fine, large species were found by the University of Colorado Pawnee Butte expedition. They occur in large numbers in the Crow Creek water-holes northeast of Greeley, and have as yet been found nowhere else in Colorado. Dr. Sterki writes: "A species from the Mississippi Valley, etc., may possibly be of the same species, not described so far as I know."

Specimens collected by Prof. Beardsley in the Cache la Poudre, near Greeley, much resemble *S. striatinum* Lam., but the shells are heavier and there are other minor differences. Another lot obtained by the same collector at the head of Rio Grande Canyon, 12 miles from Antonita, Conejos County, do not seem referable to any known species. Further material, especially from other localities, and further study of these two forms are desirable before deciding whether they are new. A few dead shells collected by Prof. E. Bethel near Meeker are near *S. striatinum*.

Genus **CALYCULINA** Clessin

Calyculina partumeia Say.

Sphærium partumeia, Saguache and Rio Grande, Yarrow **68,** 949, 950.

Calyculina securis Prime. Fig. 1 (enlarged + ½).

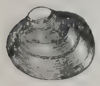

FIG. 1

A few rather small specimens, not quite typical in surface appearance, were collected by Mr. D. M. Andrews in a small lake between Magnolia and Rollinsville, in the mountains west of Boulder. Further specimens from other localities are desirable, to determine whether the variation is constant.

Calyculina rykholti Norm.

Saguache, Sterki **60,** 93. Specimens referred to this European species with hesitation.

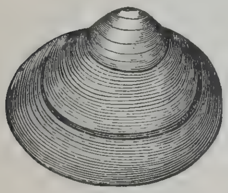

FIG. 2

Genus **PISIDIUM** Pfeiffer

Pisidium abditum Hald. Fig. 2 (very much enlarged).

Hot Springs, Animas Valley and St. Mary's Lake, Ingersoll **35,** 407. Empire, Ingersoll **37,** 134. Middle Lake of the Clouds, Powderhorn and East Fork Surface Creek, Cockerell MSS.

Pisidium noveboracense Prime.

We have obtained a few specimens from a ditch east of Boulder, but they are "small and not characteristic" (Sterki MSS.).

Pisidium variabile Prime.

Rio Grande of Colorado, Yarrow **68,** 951. Custer Co., Cockerell **22,** 64.

Pisidium compressum Prime.

Found by the University Pawnee Butte expedition in a small stream emptying into the Big Thompson near Loveland.

Pisidium friersoni Sterki.

Denver, Sterki **61,** 20.

Prof. Cockerell, to whom Dr. Sterki's specimens were credited, informs me that they were in fact collected by Prof. E. Bethel. We have collected the species from Owen's Lake and ditches east of Boulder and have received a few collected by Prof. E. A. Kenyon at Florence.

The *Pisidia* of Colorado are not sufficiently understood at present. The writer has collected several forms in the mountains west of Boulder, up to an altitude of over 10,000 feet, which have not yet been satisfactorily worked up. Dr. Sterki, who has examined our material, suggests the importance of thoroughly studying the genus with reference to differences shown by specimens from various elevations. For this purpose large collections from many localities are desirable, each lot from each locality to be carefully kept separate.

Dr. Sterki writes that "a forthcoming monograph of the North American *Pisidia* is expected to give as much in the way of comparison of species with each other as can be given in the present (or then) state of our knowledge," which will be an important contribution, as the original descriptions were evidently not written for comparative purposes.

[*Concluded in next number of these "Studies."*]

EXPLANATION OF PLATES

Plate I

Fig. 1. *Anodonta grandis gigantea* Lea.

Fig. 2. *Strophitus edentulus pavonius* Lea. *a*, from Denver; *b*, from Greeley.

Fig. 3. *Anodontoides ferussacianus* Lea.

Fig. 4. *Lampsilis ventricosa* Barnes.

Plate II

Fig. 5. *Lampsilis anodontoides* Lea.

Fig. 6. *Lampsilis luteola* Lam.

Fig. 7. *Unio tetralasmus camptodon* Say. From Las Animas County.

Fig. 8. *Sphærium hendersoni* Sterki. From Crow Creek, photographed from cotypes, the first published figure.

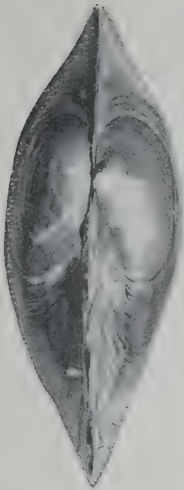
FIG 2b. × $\frac{2}{3}$

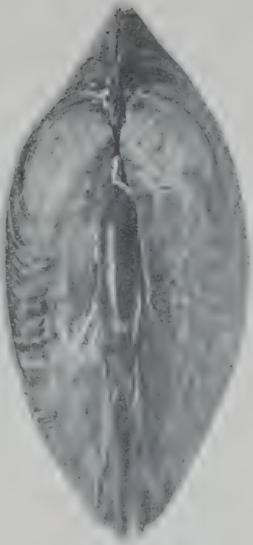
FIG. 4b. × $\frac{2}{3}$

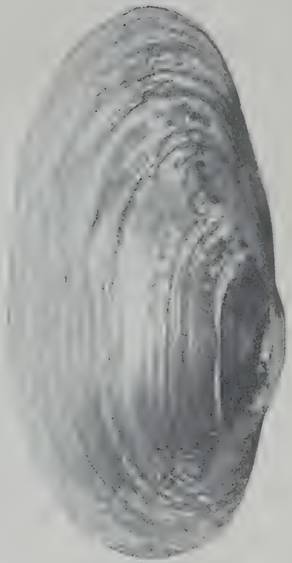
FIG. 2a. × $\frac{2}{3}$

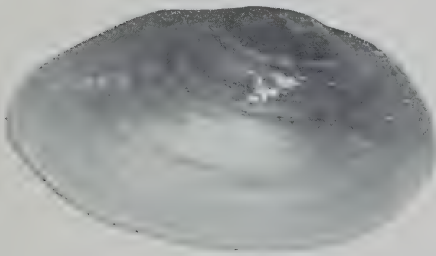
FIG. 1a. × $\frac{2}{3}$

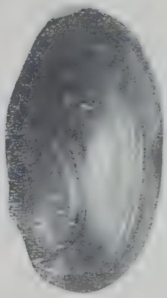
FIG. 3a. × $\frac{2}{3}$

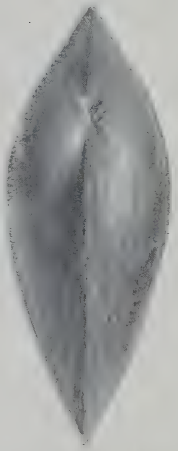
FIG. 1b. × $\frac{2}{3}$

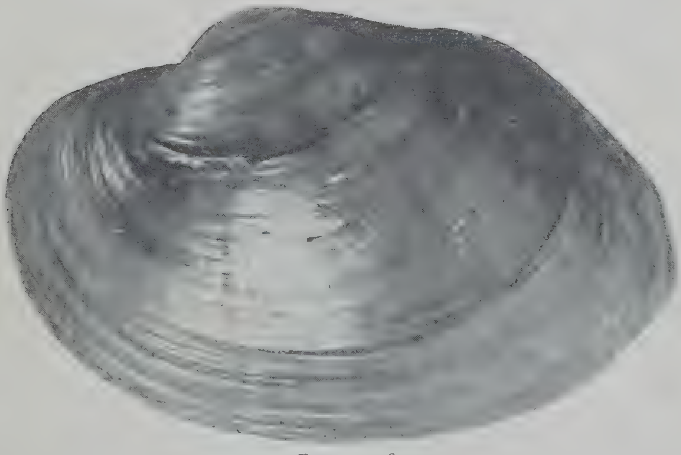
FIG. 4a. × $\frac{2}{3}$

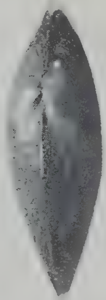
FIG. 3b. × $\frac{2}{3}$

MOLLUSCA OF COLORADO

PLATE I

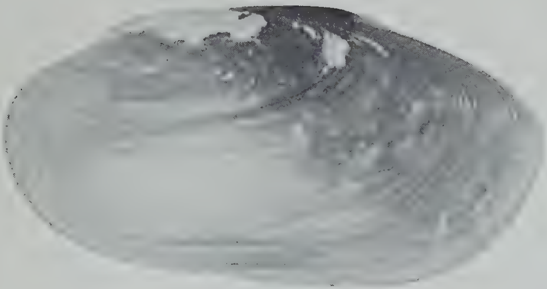

Fig. 5*a*. × ⅔

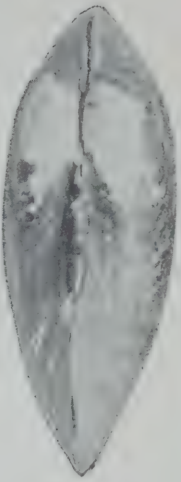

Fig 5*b*. × ⅔

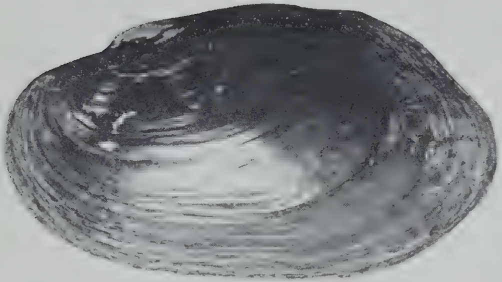

Fig. 6*a*. × ⅔

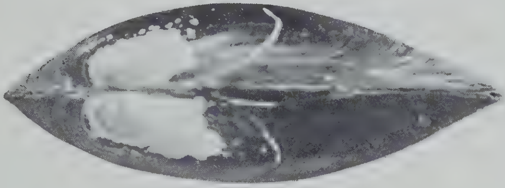

Fig. 6*b*. × ⅔

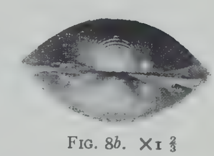

Fig. 8*b*. ×1⅔

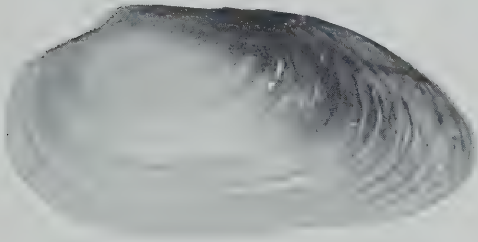

Fig 7*a*. × ⅔

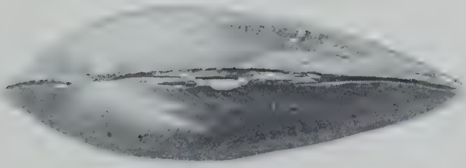

Fig. 7*b*. × ⅔

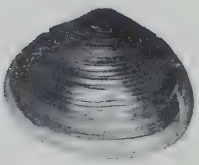

Fig. 8*a*. ×1⅔

MOLLUSCA OF COLORADO

PLATE II

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C68
no. 47

47

NOTES ON THE FOSSIL CRINOID GENUS HOMOCRINUS HALL

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BY

EDWIN KIRK
Of the United States Geological Survey

No. 2038.—From the Proceedings of the United States National Museum,
Vol. 46, pages 473–483, with Plate 42

Published February 14, 1914

Washington
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FOR·THE·INCREASE·AND·DIFFVSION·OF·KNOWLEDGE·AMONG·MEN·
PER ORBEM
SMITHSONIAN·INSTITVTION·WASHINGTON·1846·

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1914

NOTES ON THE FOSSIL CRINOID GENUS HOMOCRINUS HALL.

By Edwin Kirk,
Of the United States Geological Survey.

The genus *Homocrinus* was defined by Hall in the second volume of the Paleontology of New York. At that time the structure of the type-species, *H. parvus,* was incorrectly given and, furthermore, species representing two other genera were referred to *Homocrinus.* It would appear that the genus *Homocrinus* as there defined by Hall was intended as a sort of "catchall" for practically any Silurian or Ordovician Inadunate. The idea seems to have been to erect a genus comparable in spacious capacity to *Poteriocrinus* and *Cyathocrinus* as they were loosely used at that day. In the third volume of the Paleontology of New York, Hall referred still another species, *scoparius,* to the genus. This species is probably generically distinct from any hitherto called *Homocrinus* by Hall. Under such conditions it is no wonder that the greatest confusion has prevailed in regard to the exact status of the genus. The confusion has not been lessened by the work of subsequent authors, who instead of maintaining the first species described as the type have chosen genotypes from among the other species at one time or another referred to *Homocrinus* by Hall.

As matters stand, we apparently have a choice between no less than three type species. There is the original genotype (first species) *H. parvus; H. scoparius,* which was chosen by Wachsmuth and Springer (1879, p. 77); and, finally, *H. cylindricus,* which was made the type species by Bather (1893, p. 101). It is possible, if not probable, that these three species belong to as many genera. Under the circumstances our conception of the genus *Homocrinus* depends entirely upon the choice of the genotype.

Wachsmuth and Springer in their "Revision," because of the supposed unsatisfactory nature of the two Niagaran species referred to the genus, refused to consider either as the type species, choosing *scoparius* which was described by Hall (1859, p. 102) instead. Bather (1893, p. 101) objects to the choice of *scoparius* as the type-species on the ground that the date of the genus under these circumstances would have to be altered from 1852 to 1861, "thus predating the name by Eichwald's application of it to *Hoplocrinus dipentas*, a consequence that Wachsmuth and Springer seem to have overlooked." It is to be noted that the other two species referred to *Homocrinus* by Hall in his original description of the genus are ignored by Wachsmuth and Springer when choosing their genotype. These two species are *Poteriocrinus alternatus* Hall and *P. gracilis* Hall, which were described in the first volume of the Paleontology of New York. They have since been referred to the genus *Dendrocrinus* by Wachsmuth and Springer. An examination of Hall's diagnosis of *Homocrinus* makes it evident that the two species cited above were definitely provided for in the new genus. This is clearly shown in the description of the arms, which are stated to be "simple or bifurcating," the arms of *parvus* being simple. If *Homocrinus parvus* and *H. cylindricus* were to be eliminated as unsatisfactory, the other species could not. This would make the genotype of *Homocrinus* an Ordovician Inadunate now referred to the genus *Dendrocrinus*. If the Ordovician species be congeneric with the type species of *Dendrocrinus* this genus must fall into synonymy with *Homocrinus*, as the description of the latter genus precedes the diagnosis of the former in the second volume of the Paleontology of New York.

Bather in choosing *cylindricus* as the type species set aside *parvus*, the first species described by Hall under his new genus, as being based on unsatisfactory material and having been insufficiently described; *cylindricus* and *scoparius* he considers congeneric. As a matter of fact, the structure of *parvus* may be worked out in great detail. *H. cylindricus*, on the contrary, is represented by a not overly well preserved dorsal cup. This does not permit of exact determination, and although its genetic affinities are fairly clear, its use as a genotype is bound to result in uncertainty of generic definition. As regards the accuracy of the original descriptions of the two species there is little choice.

Such a case brings home to us most forcibly the necessity of a definite ruling restricting the powers of subsequent writers in revising the original author's conception of his genus. The question, after all, should be quite as much one of fairness to the original author as one of convenience to subsequent workers. In formulating such a rule it seems to me that paleontologists need not be governed by exactly the same regulations as other zoologists and botanists. In paleontology the type material under normal conditions is indestructible, and in the majority of cases has been preserved. So, too, as a rule, have the descriptions and figures been adequate, and the geological horizons and localities noted with a sufficient degree of accuracy. Generally the original material is to be had if one be willing to spend the time looking for it. If it be not accessible, authentic material is frequently at hand coming from the same locality and horizon. Such being the case, paleontologists may well be bound by more exact and rigid rules than workers in recent forms. In paleontology no hardship would be wrought, I think, if the first species described were always to be held as the genotype. This ruling, of course, should be effective only in those cases where the original author's choice of a genotype is not specified or indicated. In the very nature of things it is evident that an author, unless giving his species an arbitrary arrangement, tends to place his most characteristic species first. The choice of the first species as genotype is the only wholly satisfactory method of procedure, and obviates much of the confusion that is almost sure to follow the application of any other method. A number of cases might be adduced where the choice of a second type-species by subsequent authors has resulted in an absolute misconception of the true character of a genus.

It seems to me that in no case is the changing of the type-species from the one specified by the author of the genus, or if not definitely specified, the first species described, justified. In case such a species be unrecognizable, and the type material certainly destroyed, the genus should lapse, as in the case of a species under similar conditions. When, as frequently happened in former times, no species was chosen as the type of the genus, it might seem that one should seek the intent of the author, as expressed by his choice of species referred to the genus, and pick out a species other than the first described, for the reason perhaps that better material of that particular form has since become available, or for some other reason. Such reasoning is inadmissible, however. In case a genus were described and the first species is represented by such poor material that its structure could not and can not accurately be determined, the chances are that the other species referred to the genus are not congeneric.

In the present case *Homocrinus parvus*, as the first species defined under the genus, will be held as the type. No excuse is required for this action. This is peculiarly an instance that shows the impropriety of allowing a subsequent writer a voice in the delimitation of a genus by permitting him the choice of the type-species. *Homocrinus parvus* may have been incorrectly defined—as were the types of most of the early genera. The figures and analysis of the cup as given by Hall (1847, pl. 41, figs. 1*c–d*) and partially reproduced in this paper, surely give a present-day worker an inkling as to the true structure of the animal, however. The figure here copied from Hall is fairly accurate. The analysis of the cup is inaccurate in that the brachials are indicated as arising between the radials. A compound radial is unmistakable in both instances, however. Moreover, the types of *Homocrinus parvus* have been at all times accessible in the American Museum of Natural History and a fair amount of authentic material has always been available. Under such conditions the elimination of *Homocrinus parvus* as type of the genus seems unjustified.

An examination of several specimens of *H. parvus*, including the types, convinced me that the species was a monocyclic Inadunate and bore not the slightest relationship to the forms commonly referred to the genus. In order completely to clear up the matter, it was necessary to have a specimen showing all the plates of the cup. A specimen was kindly placed at my disposal by Mr. Frank Springer, and by the use of specially ground needles and working under a Zeiss binocular the minute theca was finally freed from the matrix. When cleaned and examined in a cell of glycerin the specimen showed all the plates clearly. From this specimen figures 1–4, plate 42, and the analysis of the cup given as figure 8, were made. The outline figure of a crown and portion of column given as figure 5, plate 42, is approximately accurate—as nearly so, perhaps, as a pen-and-ink drawing of this magnification may well be. Exact proportions and details of structure are not to be expected, however. For such particulars and for exact measurements, reference should be made to the text. From these figures it will be seen that the crinoid is a monocyclic Inadunate of a rather unusual type.

A description of the species *Homocrinus parvus*, the only known representative of the genus, may serve equally well as a description of the genus.

The form is minute, the crown of an individual of average size[1] giving a length over all of but 12 mm. In this specimen the height of the dorsal cup is 1.6 mm. Despite their small size the maturity of these crinoids may not be questioned. The specimens show none of the signs of immaturity, either in structure or preservation. Furthermore, the large number of *Homocrinus parvus* that have been found are of essentially the same size, which in itself is strong evidence in support of the assumption that we are dealing with adult forms. Not only must one admit that this material consists of adult specimens, but also that there is no chance of its representing dwarfed individuals. The stratum in which *Homocrinus* is found indicates normal conditions of deposition, while associated fossils show no diminution in size.

The cup is fusiform, slender, and so closely affixed to the tapering column that it is difficult on casual inspection to determine where the theca ends and the column begins. A difference in the clearness of the calcite indicates the line of demarcation with exactness, however. The calcite of the basals is notably more translucent than that of the column. A dorsal cup 1.6 mm. in height has a breadth at the arm bases of 0.95 mm. and a breadth at the junction with the column of 0.65 mm.

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[1] The measurements given here and elsewhere of various portions of the crinoid are all taken from one individual.

The basals are five in number, narrow, and unusually long. Their height is a little more than one-half that of the cup, measuring 0.9 mm. in a specimen having a total height of but 1.6 mm.

The radials consist of two simple and three "compound" plates. As usual in such forms, the simple radials are located in the anterior and left posterior rays. The various views of the theca, and the analysis of the cup given in plate 42, clearly show the shape, arrangement, and relative proportions of the plates. The r. post. Rs is hexagonal, resting below on the r. post. Ri and the r. ant. Ri, abutting laterally against l. post. R and r. post. Rs, and supporting on its left shoulder the anal x. r. post. Ri is pentagonal, resting upon the basals, and between r. ant. Ri and l. post. R. It agrees in shape with the l. ant. Ri. r. ant. Rs is quadrangular as is also l. ant. Rs. r. ant. Ri differs from the other inferradials in that it is hexagonal instead of pentagonal, joining as it does with r. post. Rs. The two simple radials are of equal height with each pair of "compound" radials, giving the cup a symmetrical outline. l. post. R supports on its right shoulder the anal x.

Of the anal structures nothing is known other than plate x. This is a small pentagonal plate which rests below equally on the right posterior superradial and the left posterior radial. Laterally it abuts against and is of equal height with the adjacent first primibrachs. It seems probable that x supported a single series of tube plates after the manner of *Ectenocrinus*.

The arms are long, slender, and nonbifurcating. One arm is borne by each ray. There is no evidence of pinnulation. The ventral furrow, as is indicated by a portion of an arm a few millimeters in length, seems to be closed by a double series of alternating covering plates. The first primibrachs are very short and occupy practically the entire breadth of the radial. Measurements in different individuals give a height of 0.35 mm. for this ossicle. The next succeeding brachial and those following up to fully one-half the length of the arms have a practically constant length of 1 mm. In the distal portion of the arms the ossicles tend to shorten very slightly. An ossicle which probably next preceded the terminal has a length of 0.9 mm. The arms are comparatively tenuous, at about one-half the height of the arm the breadth of an articulation being but 0.25 mm. Each ossicle is widest at its extremities, narrowing slightly toward the middle. The shortness of the first primibrachs in cases where the arms are proportionally long or heavy or composed of unusually long ossicles is a feature to be noted in other genera. The first primibrachs of adjoining rays of *Homocrinus* are but slightly separated, and probably when bent inward were in contact laterally.

The column is round. In its proximal portion and for a distance of about 0.6 mm. it tapers rapidly, maintaining the angle of the lower portion of the dorsal cup. Distad from this point the column maintains a fairly uniform diameter. At about 5 mm. from the theca the column has a diameter of 0.3 mm. In the sharply narrowing portion of the stem the ossicles are comparatively low and apparently not differentiated into nodals and internodals. In the next millimeter there are alternating wide and narrow ossicles of about the length of those noted above. Distad from this area the columnals are considerably longer and of approximately equal size. From these facts it may be inferred that in adult specimens at any rate increase in the length of the stem by the intercalation of new columnals took place chiefly in that portion of the column lying immediately distad to the proximal group of tapering ossicles. The column attained a length of perhaps five or six times that of the crown. The extreme distal portion of the stem has not been observed.

The geological horizon of *Homocrinus parvus* is at the top of the lower third (lower 17 feet) of the Rochester shale (Niagaran), according to Ringueberg (1888, p. 269). It has only been recorded from Lockport, New York, where it is found associated with characteristic Niagaran fossils.

It is difficult exactly to establish the relationships of *Homocrinus*. On the whole, the affinities of the genus seem to be closest to the Heterocrinidæ, and the genus might well be placed here were it not for its simple, nonbifurcating arms. The simplest type of arm among the Heterocrinidæ is isotomous. It is obviously impossible to derive *Homocrinus* from any known form referred to the family on this account. *Ectenocrinus*, which precedes *Homocrinus* by a considerable period of time, is the form to which *Homocrinus* is most closely comparable structurally. Indeed the arrangement of cup plates in the two genera is essentially identical. The later form, however, has the more simple arms. We may postulate a common ancestor for *Ectenocrinus* and *Homocrinus*. Such a form would probably partake more nearly of the nature of *Homocrinus* than any other known genus. Were the geological positions of the two genera reversed one might well consider *Homocrinus* not far out of the ancestral line which evolved *Ectenocrinus*. We have illustrated here a case of the primitive ancestral type surviving with perhaps few marked modifications long after the extinction of more complex derivatives of the parent stock.

Among the genera of contemporaneous and subsequent geological occurrence *Homocrinus* occupies a somewhat anomalous position. The genus has a similar arm structure to that of the Pisocrinidæ and Haplocrinidæ. The cup has the essential arrangement of plates of *Haplocrinus* as well, with the exception of x reaching down into the cup, as in the Heterocrinidæ. This indicates the presence of an anal tube and a type of tegmen quite at variance with that of *Haplocrinus*. Under the circumstances it has seemed best to establish a new family Homocrinidæ for the reception of the genus. This family may be defined as follows:

HOMOCRINIDÆ, new family.

Monocyclic Inadunata, with 5 B B, 5 R R (3 compound) and an anal x in the cup. The l. post. R and ant. R are large and undivided. In the other three rays the radials are compound. x enters into the composition of the cup, resting equally on the right shoulder of l. post. R and the left shoulder of r. post. R. The presence of an anal tube is predicated. The arms are nonpinnulate and do not bifurcate.

The family as here defined includes but the one genus *Homocrinus*.

Whether *Homocrinus* itself ever gave rise to a line of descendants is a question at present impossible of solution. The Homocrinidæ or forms of very similar structural character might perhaps serve as the ancestral stock for the Pisocrinidæ, Haplocrinidæ, and similar types. A crinoid not widely divergent from *Homocrinus* might, on the other hand, have formed the radicle from which sprung the Heterocrinidæ. Such modifications as are to be observed in these genera are no greater than one might reasonably expect, and indeed the only types from which the Pisocrinidæ and Haplocrinidæ could be derived would partake very largely of the nature of *Homocrinus*. One can but hope that future collections will make it possible to work out in some detail the evolution of this or similar minute forms. With this data in hand the bearing such types have on the evolution of the Crinoidea in general will become more obvious. Until such time our conclusions though apparently logically sound can be but speculative at best.

The existence of such a form as *Homocrinus parvus* causes one to wonder if during Paleozoic time, and perhaps later, there did not live many equally minute crinoids. We know in the Mississippian for example, that there was a species of *Allagecrinus* quite as small as *Homocrinus parvus*. Such types were not derived from crinoids larger than themselves. In the development of any group of invertebrates the trend of evolution is from the small to the large, and never the reverse except in special cases of degeneracy or dwarfing. *Homocrinus* though showing no positive tendencies in any direction, owing to our lack of knowledge relative to its ancestors or descendants, certainly shows no signs of degeneracy. The improbability of its having been dwarfed has been noted elsewhere. Such being the case we may postulate for *Homocrinus* ancestors of similar size or even smaller.

If we assume the existence of such a practically unknown congeries of microscopic crinoids, as we well may be justified in doing, it seems possible that these small types at various times may have furnished points of inception for evolutionary lines among the Crinoidea. Certain it is that the maintenance of such a basic stock would serve to explain the presence of many otherwise anomalous forms in our Paleozoic rocks. Many of our Inadunata might be cited as examples. Some of these types appear quite suddenly, and though frequently of wide geographic range and of notable strength numerically, are without known antecedents. As an instance of this sort, we have *Haplocrinus*, a form curiously primitive in many respects despite its Middle Devonian occurrence. This genus has a known range from Germany to New York State. As elsewhere suggested, this genus may well have been derived from a form not greatly dissimilar to *Homocrinus*. One or two such cases of apparently isolated types might be explained on the assumption of sudden introduction into a given area of hitherto excluded faunas. To attempt to explain all such cases and the related phenomena on such a basis would involve an unnecessary assumption of unstable seas and barriers.

The importance of such a simple group in determining or influencing the evolution of the Crinoidea is largely dependent upon the ability of its constituent members under the impetus of changed conditions or for other cause, to vary and give rise to sturdy lines in which the tendency toward mutation is perpetuated. One must predicate such power as latent in these minute forms, else their interest and importance lies solely in their existence. As is well known, a type that persists for a long time apparently loses its power to vary, at least fundamentally. So it is in the case of many long-lived brachiopods. Such instances are those preeminently of genera and species. It probably is true that in larger groups much the same condition of affairs obtains, though in a less marked degree. With them the tendency toward variation is arrested rather than destroyed, however, and though somewhat impaired in vigor may be revived by the application of competent stimuli. Subsequent to such stimulation it may well be that the resultant lines do not have the inherent strength of those evolved earlier in the history of the stock, but such differences tend to be quantitative rather than qualitative. Such limitations necessarily apply only to the minute primitive forms of the later Paleozoic. The status of such forms in the early history of the Pelmatozoa is probably quite different. Here there existed anything but a condition of stagnation. In their small way mutations doubtless were of frequent occurrence and of appreciable weight.

How very acceptable such an hypothesis will prove may readily be seen. Given a persistent stock of primitive character and one may predicate offshoots in the evolution of which convergence and parallelism will generate types strikingly similar in many respects and yet incapable of derivation one from the other. That conditions exist among the Crinoidea explicable only on the assumption of the existence of numerous polyphyletic strains seem capable of demonstration. Indeed it is probable that few of the groups into which the Crinoidea have been subdivided are monophyletic—unless such groups be comparatively small and closely circumscribed.

The existence of a potent primitive stock among the Crinoidea is of large importance as determining evolution within that group. If we extend our horizon the bearing of such a stock on the Pelmatozoa as a whole presents features of even greater consequence. The interrelationships of the classes of the Pelmatozoa have always been a matter of no little uncertainty—even to the extent of establishing plausible connections between the classes. The solution of the matter lies, I think, in the acceptance of a minute stock in which fundamental modifications may well have taken place and from which the various classes diverged more or less independently. There is no reasonable objection to such an hypothesis and it has much of the available evidence in its favor.

It has generally been conceded that the Crinoidea have been derived from the Cystidea, perhaps through the mediation of the Blastoidea. Such may be the case—but not from the Cystidea or Blastoidea as we know them. As we trace back any given crinoid line, at least in that portion of the line antecedent to the acme of the group, we find a uniform decrease in the size of the organisms. Eventually we come to the small simple Inadunata. To evolve these simple forms from the Cystidea as we know them is a contravention of the fundamental laws of evolution. If we admit these facts we must look elsewhere than among the known Cystidea for the ancestors of the Crinoidea. The ancestors no doubt may have had much the same structure as the Cystidea and evolved their comparatively simple arrangement of plates by much the same process that we may more or less readily trace in the elimination of plates among the Cystidea. The whole evolution, however, was on an infinitesimal scale. Did such types exist, as seems to be the logical conclusion, one could style them perhaps "Cystidea", as that term might broadly be defined. That there should be minute Cystidea is no more improbable than that there should be minute Crinoidea—which we know exist. Such minute "Cystidea" might well precede and give rise to the known Cystidea, as well as to the other classes of the Pelmatozoa.

Having shown *Homocrinus* to be a monocyclic Inadunate of quite different affinities than has hitherto been supposed, it becomes necessary to define a new genus for the reception of such forms as "*H.*" *scoparius*. For this genus I here propose the name *Lasiocrinus*, taking *scoparius* as the type of the genus. For the time being but two species will be referred to the genus, *scoparius* and *tenuis*. The systematic position of the other species called *Homocrinus* by Bather (1893, p. 101) is doubtful. I have examined the types of *ancilla* and *cylindrica* and at present feel disinclined to include them in the same genus with *scoparius*. In a future more extended discussion of *Lasiocrinus* the possible affinities of the forms hitherto called *Homocrinus* will be treated at length. Inasmuch as this genus is composed of forms that are so well known, and the characters upon which it is founded are those upon which the genus "*Homocrinus*" has hitherto been maintained, it is scarcely necessary to describe the genus in any considerable detail.

LASIOCRINUS, new genus.

1852. ? *Homocrinus* HALL part, Paleontology of New York, vol. 2, p. 185.
1859. *Homocrinus* HALL, Paleontology of New York, vol. 3, p. 102.
1879 and 1886. *Homocrinus* HALL part, Wachsmuth and Springer, Revision of the Palæocrinoidea (Author's Edition), pt. 1, p. 77; pt. 3, p. 220.
1893. *Homocrinus* HALL part, Bather, Crinoidea of Gotland, p. 101.

I B B 5, pentagonal, equal. B B 5, hexagonal, with the exception of post. B and r. post. B which are heptagonal. R R relatively small with the arm facets occupying practically the entire width of the upper faces of the plates. R A rhomboidal, small, resting below on the left shoulder of r. post. B and the right shoulder of post. B. Above it supports x and r. post. R. Anal x rests below on post. B and R A. Laterally it meets l. and r. post. R R, and above it supports two plates of the anal tube. The anal tube is long and after a point a short distance above its base is composed of a somewhat variable number of parallel rows of small hexagonal plates. The arms are long and in the type species divide by bilateral heterotomy at regular intervals. The arms of earlier species are apparently dichotomous, as might be expected. The column is round. In plate 42, figures 10–12 are given to show the essential features of the type species *Lasiocrinus scoparius*. Figure 10 gives an excellent idea of the structure of the ventral sac, and figure 11 shows the method of division of the arms and general proportions of the crown. Figure 12 is an analysis of the dorsal cup. The figure of *Lasiocrinus tenuis* (fig. 9) is given to show the structure of the earlier, Silurian member of the genus.

Lasiocrinus has a vertical range from the Silurian of Gotland apparently to the Onondaga of New York. Besides the species already noted there are new species probably referable to this genus in the Manlius, New Scotland, Oriskany, Schoharie, and Onondaga formations. The genus is characteristically a Devonian one, with the exception of the Manlius and the Gotland Silurian forms.

Type of the genus.—Homocrinus scoparius Hall.

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1879. Wachsmuth and Springer. Revision of the Palæocrinoidea: Pt. 1. Proc. Acad. Nat. Sci. Philadelphia for 1879, pp. 226–378, pls. 15–17. Author's edition, 153 pp. pls. 1–3.

1886. ——— Revision of the Palæocrinoidea: Pt. 3, sec. 2, Proc. Acad. Nat. Sci. Philadelphia for 1886, pp. 64–226. Author's edition, pp. 139–334.

EXPLANATION OF PLATE 42.

Homocrinus parvus Hall.

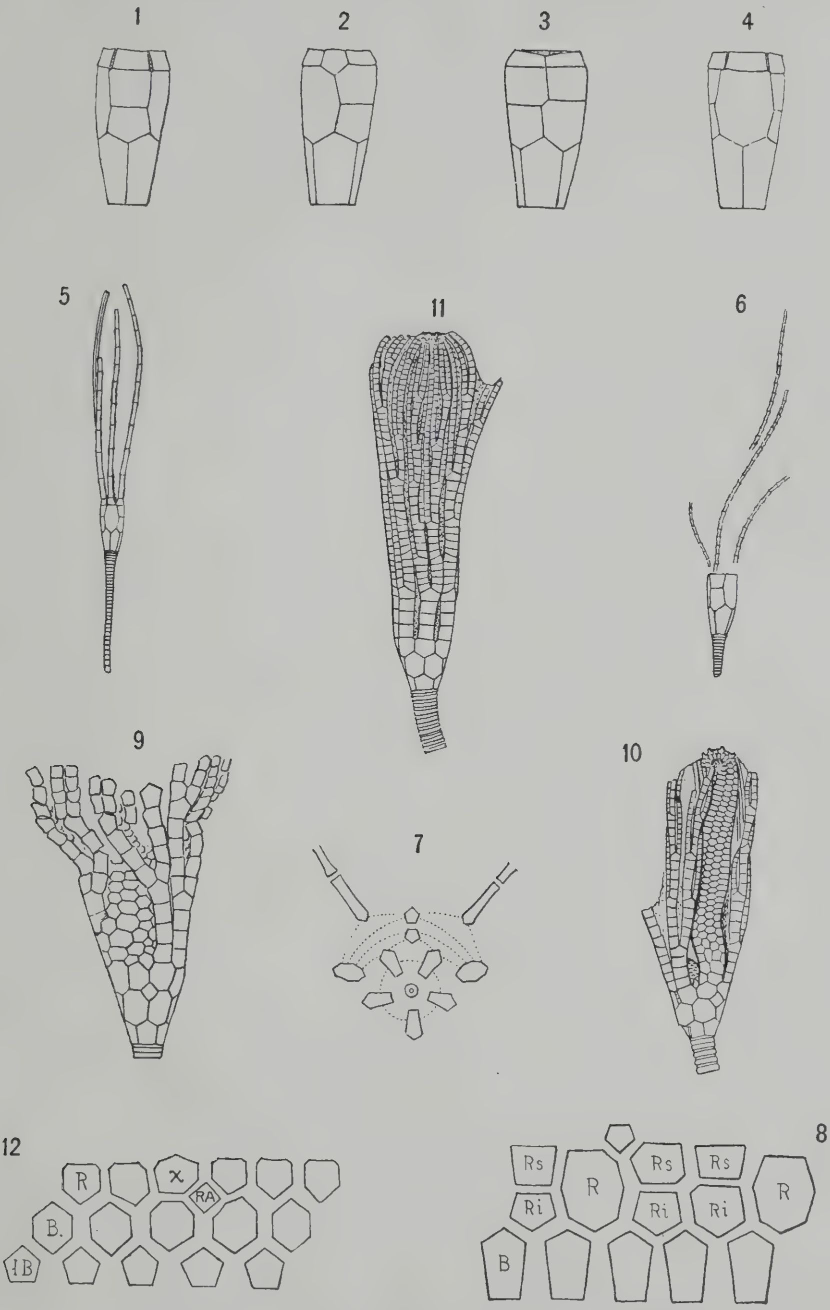
Fig. 1. View of left anterior radius of dorsal cup, and first primibrachs. × 8.
2. View of posterior interradius. × 8.
3. View of right posterior interradius. × 8.
4. View of anterior radius. × 8.
5. View of another specimen showing crown and portion of column. × 3.
6. View apparently of left anterior radius × 3? after Hall, Pal. New York, vol. 2, pl. 41, fig. 1*c*.
7. Analysis of dorsal cup, copied from Hall, Pal. New York, vol. 2, pl. 41, fig. 1*d*.
8. Analysis of the dorsal cup. × 8.

Lasiocrinus tenuis (Bather) new combination.

Fig. 9. Posterior interradius × 3, after Bather, Crinoidea of Gotland, pl. 4, fig. 144.

Lasiocrinus scoparius (Hall) new combination.

Fig. 10. Posterior interradius of one of the type specimens. × 2.
11. View of crown × 2, probably of anterior radius.
12. Analysis of dorsal cup. × 4.



Crinoids of the Fossil Genera Homocrinus and Lasiocrinus.

For explanation of plate see page 483.

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No. 1 u. 2. **Januar-Februar 1886.**

Nachrichtsblatt
der deutschen
Malakozoologischen Gesellschaft.

Achtzehnter Jahrgang.

Erscheint alle zwei Monate und wird gegen Einsendung von Mk. 6.— an die Mitglieder der Gesellschaft franco geliefert. — Die Jahrbücher der Gesellschaft erscheinen 4mal jährlich und kosten für die Mitglieder Mk. 15.— Im Buchhandel werden diese Zeitschriften nur zusammen abgegeben und kosten jährlich Mk. 24. —

Briefe wissenschaftlichen Inhalts, wie Manuscripte, Notizen u. s. w gehen an die Redaction: Herrn **Dr. W. Kobelt** in Schwanheim bei Frankfurt a. M.

Bestellungen (auch auf die früheren Jahrgänge), ***Zahlungen*** und dergleichen gehen an die Verlagsbuchhandlung des Herrn **Moritz Diesterweg** in Frankfurt a. M.

Andere die Gesellschaft angehende ***Mittheilungen,*** Reclamationen, Beitrittserklärungen u. s. w. gehen an den Präsidenten: Herrn **D. F. Heynemann** in Frankfurt a. M.-Sachsenhausen.

Mittheilungen aus dem Gebiete der Malakozoologie.

Exkursionen in Nord-Afrika.

Von

W. Kobelt.

(Fortsetzung).

13. Nach Biskra.

Um fünf Uhr früh am 29. Mai sassen wir schon in der Diligence und rollten zum Thor hinaus der Wüste zu, durch das breite völlig ebene Thal zwischen der Masse des Tuggur und den Vorbergen der eigentlichen Aurès. Anfangs sieht man noch einige gute Felder, dann beginnt eine entsetzliche Einöde, wie um Boghar, von ebenso kahlen Bergen eingefasst, über die sich beherrschend der Pic des Cèdres erhebt. Die Fahrt ist entschieden sehr langweilig, wurde uns aber in angenehmer Weise verkürzt durch die Begegnung mit einem der Wüstenstämme, der mit etwa 2000 Kameelen und unzähligen Schafen seinen Sommerweiden im Gebirg zuzog, ein charakteristisches, an das alte Testament erinnerndes Bild.

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*) Cfr. Nachr. Bl. XVII. p. 129.

Bei el Biar, einer unbedeutenden Ansiedlung, mündet von links her ein Seitenthal ein, und nun befanden wir uns im Gebiet der Wüste oder doch wenigstens des ihr zufliessenden Uëd Kantara. Eine Wasserscheide zwischen ihm und dem Gebiet der Salzseen ist hier nicht vorhanden, man erkennt deutlich, dass sich einmal bis nach Constantine hin ein Hochsee dehnte, der vielleicht nach zwei Seiten Abfluss hatte. Die Wasserrinnen schneiden immer tiefer ein und rücken immer näher nach Batna hin; es ist nur eine Frage der Zeit, dass die Bäche des Cedernpiks für das Gebiet des Wüstenflusses gewonnen sein werden. Noch eine Zeit lang geht es auf ebenem Boden weiter bis zur Relaisstation Ain Touta, wo man eine Anzahl Elsässer angesiedelt hat, die aber trotz des fruchtbaren Bodens nicht sonderlich zu prosperiren scheinen; dann tritt am Horizont eine seltsame scharfgezackte Felsenkette auf, welche Plateau und Wüste scheidet und nun geht es auf guter Strasse steil hinab in einen Kessel, den entsetzlich kahle Bergwände ringsum einschliessen. Unten sehen wir uns vergeblich nach einem Ausgang um, nicht der geringste Spalt ist in den Felswänden zu sehen und nur der zur Seite schäumende Uëd Kantara verbürgt uns, dass irgendwo ein Durchgang sein muss. Noch einmal biegen wir um eine Ecke, da liegen europäische Häuser von grünen Bäumen umgeben vor uns und auf einer kleinen Ebene am Fuss der Felswand lagert eine Abtheilung Chasseurs d'Afrique; wir fahren über eine schöne Eisenbrücke und halten gleich darauf vor dem Hotel Bertrand.

Hier wollen wir einen Tag anhalten; das Hotel ist dazu ganz geeignet und die Umgebung sieht sehr versprechend aus. Die glühende Hitze zwingt uns zu kurzer Mittagsrast, aber schon um drei Uhr eilen wir wieder hinaus, dem nahen Felsen zu.

Zwischen den himmelhoch emporragenden, von der Verwitterung zerfressenen Wänden des Dschebel Gaus und des Dschebel Tilatu hat sich hier der Bergstrom eine Kluft gefressen welche nur gerade ihm Raum bietet; aber schon die Römer, wenn nicht schon ihre Vorgänger, haben hier eine Strasse in den Felsen gehauen und eine Brücke über das tosende Wasser gesprengt, die, ein seltenes Beispiel in diesen Ländern der Vernachlässigung und des Verfalls, alle Völkerstürme überdauert hat und, neuerdings von den Franzosen restaurirt, dasteht als wollte sie noch manches Jahrhundert aushalten. Als die einzige Brücke südlich der Hochebene hat sie sogar dem Flusse, der Schlucht und der Oase ihren Namen gegeben, der arabisch Brücke bedeutet. Sie ist freilich überflüssig geworden, denn eine neue Strasse ist am linken Ufer in den Felsen gehauen und der Verkehr geht ausschliesslich über die neue Eisenbrücke oberhalb des Hotels.

Auch wir gingen die neue Strasse entlang bis zu dem Punkte, wo sie die alte Brücke berührt. Völlig kahle Felsenwände umgeben uns; die Gärten um das Hotel werden durch eine Felsecke verdeckt, keine Spur von Grün ist sichtbar, die glühende Maisonne hat schon alles verbrannt. Da treten wir hinaus auf die alte Brücke und zwischen den Felswänden der kurzen Schlucht blicken wir hinaus auf eine dichte fast schwarzgrüne Baummasse, den Palmenwald von el Kantara, die erste Oase. Es ist ein wunderbarer überwältigender Anblick, der sich dem Geiste unauslöschlich einprägt. Hier an der Brücke beginnt die Wüste, die Sahara, nicht nur für den Araber, der die Stelle darum Fum esch Sahara, den Mund der Wüste nennt, sondern auch für den Geologen. Die steilen Wände, mit denen die Felsenketten nach Süden abfallen und die sich viele Meilen lang in gleicher Weise fortsetzen, sind die Bruchflächen zwischen dem Hochplateau, das seinem ganzen Bau nach noch zu Europa gehört und in welchem Süss die direkte Fortsetzung des Apennin sieht, und der niedergesunkenen Wüstenscholle, die an den Faltungen des europäischen Gebirgssystems so wenig Theil genommen hat, wie der Sudan, zu dem sie naturgemäss gehört. Die Kolonisten wollen freilich nichts davon wissen und rechnen den Anfang der Wüste erst vom Ende der Oasen des Zab an; bis dorthin reicht die Vorwüste.

Wir konnten uns nicht satt sehen an dem wunderbaren Anblick, aber endlich rissen wir uns doch los und wandten uns der Untersuchung der Felswände zu. Leider mussten wir uns aber überzeugen, dass wir auch hier schon im Gebiet der Wüste waren; keine Spur von Schnecken war an den Wänden zu finden. Auf den klippigen Abhängen hinter dem Hôtel kroch ganz einzeln *Leucochroa candidissima* herum, auch *Stenogyra decollata* und *Helix Constantinae* fanden sich einzeln in todten Exemplaren und *Helix melanostoma* subfossil, das war alles. An den Mauern innerhalb der Oase und den schmalen Rasenbändern an ihrem Fuss fanden wir in ziemlicher Anzahl eine kleine Xerophile (ob *Helix Reboudiana var. subcostata* Bgt.?), im Fluss und in den Wässerungsgräben Nichts.

Die Fauna muss aber nicht immer so arm gewesen sein, denn als wir am andern Vormittag etwas gegen die Hochebene wieder zurückgingen, fanden wir auf einer ganz schmalen Stelle der Chausseeböschung, anscheinend in einer ausgefüllten Kluft eine Menge gut erhaltener, subfossiler Landschnecken, darunter in erster Linie auffallend eine kleine Form von *Helix punica*, mitunter nur halb so gross, wie bei Lambessa, ferner *Hel. Constantinae*, *aspersa*, zwei kleine anscheinend unbeschriebene Xerophilen, zwei bis drei *Ferussacia*, eine *Hyalina*, zwei *Pupa* und ein *Bulimus.* Ich werde diese interessante Faunula demnächst eingehender behandeln. Natürlich kletterten wir alsbald auf die Höhe, von welcher die Schnecken herab geschwemmt erschienen, aber auf dem mit einzelnen Büschen des Dent du Chien bewachsenen öden Steinfeld fanden sich nur *Leucochroa candidissima* und *Stenogyra decollata.* Genauere Untersuchung in besserer Jahreszeit und an anderen Stellen des Wüstenabhanges wird die subfossilen Formen wohl auch noch lebend nachweisen. Von Insekten flogen zahlreiche, Schmetterlinge, besonders Noctuen*) um die isolirten blühenden Labiaten, die Käfer waren weniger zahlreich, von Reptilien erhielt ich hier nur ein paar Stachelschxanzeidechsen (*Uromastix acanthinurus*) und unsere gemeine *Rana esculenta*; doch sah ich auch ein paar Eidechsen und eine Schlange, welche aber in den verfallenen Mauern nicht zu fangen waren. Früher im Jahre dürfte das Hôtel am Mund der Wüste ein guter Standort für Naturforscher sein, um so mehr, als man von dort bequem in ein paar Aurès-Thäler gelangen kann. Wir waren aber offenbar zu spät gekommen, und so hielten wir uns auch nicht länger auf, sondern bestiegen am andern Mittag wieder die Diligence um nach Biskra weiterzufahren.

Wenn ich oben sagte, dass am Mund der Wüste die abgesunkene Region beginne, die an der Faltung des europäischen Schichtensystemes nicht mehr Theil genommen habe, so ist das nicht so zu verstehen, als ob von nun an das Land schon vollkommen eben sei. Der Uëd Kantara

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*) Es waren zum Theil wohlbekannte deutsche Arten, die ich hier am Rande der Sahara traf, Distelvogel, *Colias edusa,* das Karpfenschwänzchen, ein Weissling *(Pieris daplidice),* dann die gemeine Gammaeule, ausserdem besonders *Plusia Ni, Heliothes peltiger* und *Charadrina exigua,* die auch in den Oasen häufig sind (Det. Saalmüller).

fliesst vielmehr noch eine geraume Zeit durch ein zerrissenes Hügelland, das vom Schutt der hohen Aurès gebildet worden zu sein scheint, und der Weg hat eine Menge von im Sommer trockenen Wildbächen zu passiren, welche dem Flusse zu führen. Mit el Kantara hört die gute Strasse auf, nur eine breite Wegspur führt durch die Einöde, die Uebergänge über die Flussbetten sucht sich jedes Fuhrwerk selbst, und so ist es kein Wunder, dass ein Umwerfen nicht zu den Seltenheiten gehört. Wir hatten Glück; im Winter war ein hoher französischer Functionär desselbigen Weges gefahren und hatte sich bei einer solchen Gelegenheit die Nase verschunden; das hatte geholfen und die schlimmsten Stellen waren ausgebessert, so dass wir ohne Unfall hinüberkamen. Mit geringen Unterbrechungen ist heute das ganze Land kahle Steppe, nur im Winter und Frühjahr von den Heerden der Beduinen durchzogen; aber überall stehen Römertrümmer und beweisen dass das Land einst in ganz anderer Weise kultivirt war. Die Entwaldung der Aurès mag zur Verödung der Gegend beigetragen haben, aber an eine bedeutende Klimaveränderung kann ich nicht glauben; eine dichtere Bevölkerung, die mit dem Wasser sparsam genug umzugehen verstünde, und ein paar Barragen in dem das ganze Jahr hindurch Wasser führenden Fluss könnten dem Land schnell seinen früheren Wohlstand zurückgeben. Die Verödung ist namentlich erfolgt durch die räuberischen Beduinen, welche jährlich zweimal von und nach den Sommerweiden hier durchziehen und vor denen die Berber sich in die ummauerten Dörfer der Oasen zurückgezogen haben.

Nach etwa zweistündiger Fahrt tauchten ein paar Palmen vor uns auf, aber ehe wir sie erreichten, passirte uns etwas, was wohl noch keinem Wüstenfahrer Ende Mai vorgekommen, wir blieben im Schlamm stecken und mussten aussteigen und den Weg nach der Source aux Gazelles zu Fuss machen. Hier mündet ein breites Thal aus den Aurès, und ein Wolkenbruch im Gebirge hatte ein paar Tage vorher die ganze Gegend überschwemmt und die französische Familie, die sich hier in einer geräumigen Bretterbude angesiedelt, in eine sehr unerwartete Noth gebracht. Der kurze Gang gab mir Gelegenheit, eine Anzahl *Leucochroa candidissima,* die in der ganzen Vorwüste nirgends zu fehlen scheint, aufzulesen. Xerophilen waren keine zu finden. Nach kurzer Rast und Erquickung — das Wasser hing in einem mit Krahnen versehenen Segeltuchschlauch unter der Rohrveranda — ging es weiter. Der Boden zeigte nun überall Salzefflorescenzen, ein Beweis, dass der berühmte Salzberg von el Utaja nicht fern; die Vegetation war aber üppiger als seither; Binsen, Halfagras und blaugrüne Salzpflanzen bedeckten den Boden ziemlich dicht. Auf einer langen Gitterbrücke, welche die früher nicht ganz ungefährliche Passage erleichtert, überschritten wir den noch recht wasserreichen Fluss; auch die Strasse ist hier für eine Strecke weit gebaut und wir kamen ohne Unfall auf die Höhe des früher so gefürchteten Col des Lions. Vor uns lag nun ein ungeheures ebenes Becken, ringsum von kahlen, kühngeformten Bergketten eingefasst, und eine kurze Fahrt brachte uns an den Eingang der Oase el Utaja, wo eine Elsässerin ein kleines Wirthshaus hielt. Eine halbe Stunde weiter liegt die Musterferme des Herrn Dufour, welche beweist, was aus dieser herrlichen fruchtbaren Ebene gemacht werden könnte, wenn mehr Menschen da wohnten, aber für den Mitteleuropäer ist es hier schon zu heiss, Berber scheint man nicht ansiedeln zu wollen und so liegt der weitaus grösste Theil des gegen sechs Quadrat-Meilen grossen Beckens brach. Drei gute Stunden brauchten wir, um es zu durchfahren; überall bestand der Boden aus feinem, steinfreiem Lehm, wie er nur aus stillem Wasser ausfallen kann, und ein Rückblick vom Col de Sfaa, welcher die Ebene nach Süden begränzt, beseitigte den letzten Zweifel, dass die ganze Ebene ein ehemaliges Seebecken ist, und zwar ein Einsturzbecken, das mit dem feinen Detritus der Aures erfüllt und durch den Durchbruch des Uëd Kantara, der von nun an den Namen Uëd Biskra annimmt, trocken gelegt worden ist. In meinen Reiseerinnerungen*) habe ich weiter ausgeführt, welche Wichtigkeit diese Thatsache bezüglich der Erklärung der früheren leichteren Passirbarkeit der Sahara hat und kann hier darauf verweisen.

Auch die schwierige Passage über den Col de Sfaa ist nun durch eine gute Strasse erleichtert, wird aber bei ihrem steilen Anstieg den Pferden noch sauer genug. Auch hier war *Leucochroa candidissima* noch häufig, aber sonst kein Leben zu sehen. Oben hielt die Diligence und wir sprangen aus dem engen Coupée, denn nun breitet sich vor dem Auge des Reisenden wirklich die unabsehbare Wüste aus, die nach Süden hin wie das Meer sich ohne deutliche Grenze mit dem Himmel verschmilzt. La mer, la mer, riefen die Franzosen, als sie zum erstenmal auf diesen Joche standen, und auch für uns war der Eindruck derselbe. Aber es war nicht das glatte, kaum merklich wogende Meer, das wir vor uns sahen, sondern wilde, im Sturm erstarrte Wogen, und schwere Gewitterwolken, die dicht auf dem Boden liegend gegen uns heranzogen, machten die Täuschung so vollständig, dass wir unwillkührlich nach dem Donner der Brandung aushorchten. Aber nur der Donner des Gewitters grollte immer näher und rasch ging es wieder in den Wagen und im schärfsten Trab jagte die Diligence die steilen Serpentinen hinunter und durch das zerrissene Plateauland den nahen Palmenwäldern von Biskra zu. Es fing an zu regnen und ein seltsames Schauspiel bot sich uns dar; jeder Tropfen, der auf die heissen Steine fiel, zischte auf, als falle er auf glühendes Eisen, und in wenigen Minuten deckte eine Schicht Wasserdampf mehrere Fuss hoch die ganze Fläche und liess sie in der beginnenden Dämmerung und unter den schwarzen Wetterwolken noch unheimlicher erscheinen. Aber noch rechtzeitig, ehe das eigentliche Unwetter losbrach, erreichten wir die Cypressen und Palmen, welche den Eingang der Oase bezeichnen, und bald sassen wir wohl geborgen im Hotel du Sahara.

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*) Reiseerinnerungen aus Algerien und Tunis, Frankfurt, Diesterweg, Cap. 17 p. 336 ff.

Die Nacht in den engen, dunstigen Zimmern, in denen keine Lüftung möglich war und es an Wanzen und Schnaken nicht fehlte, war sehr unerquicklich, und Freund P., nur an die kühle Alpenluft gewöhnt, wollte um keinen Preis länger als einen Tag bleiben. Da Oasen bekanntlich auch dem Schneckensammler wenig bieten, stimmten wir seinem Vorschlag, gleich in der nächsten Nacht wieder zurückzufahren, gerne bei und benutzten den Tag um die Oase und namentlich den Garten des Herrn Landon genau zu inspiziren. In den Bewässerungsgräben wimmelte es von *Melanopsis*, sonst waren Schnecken nicht zu sehen, aber eine Exkursion welche ich am Nachmittag mit dem etwas naturwissenschaftlich geschulten Hilfskellner des Hotels nach den Bergen hin machte, ergab lebend oder subfossil noch *Leucochroa condidissima*, eine Zwergform von *Helix vermiculata*, *Helix Reboudiana* und *Stenogyra decollata.* Diese Exkursion liess mich überhaupt den Beschluss, abzureisen, bereuen, denn die Ausbeute an Käfern war sehr interessant, und ganz besonders erfreuten mich verschiedene schöne Cicindeliden, darunter der prachtvolle *Anthius sexmaculatus;* auch von dem sonderbaren *Scarites gigas* fand ich ein leider zerfressenes und nicht mehr brauchbares Exemplar. Entomologen diene zur Notiz, dass man hier nur auf Sand reichere Ausbeute hoffen kann; eine Ausnahme machen nur die schönen Buprestiden (*Julotis*), die man in den zerstreuten Büschen des Taim suchen muss.

Um zwei Uhr Nachts rasselten wir wieder zur Oase hinaus, gerade dem Polarstern entgegen, der vor uns erglänzte. Es war eine etwas unheimliche Fahrt, denn der Kondukteur zündete keine Laternen an, sie blendeten doch nur, und im Dunklen ging es an den steilen Hängen hin und durch die Ravins hindurch. Aber die Pferde machten den Weg nicht zum erstenmal und gegen neun waren wir wieder am Munde der Wüste und konnten uns wieder einmal satt trinken an dem köstlichen Quellwasser am Hotel du Kantara. Diesmal wurde aber nicht angehalten; nach kurzer Rast klemmten wir uns wieder in das enge Coupee und liessen uns weiter schleppen durch den glühenden Sonnenbrand, bis wir nach fünfzehnstündiger Fahrt endlich wieder in Batna anlangten. In spätestens zwei Jahren wird es der Tourist bequemer haben, und sich vom Dampfross bis nach Biskra hinein tragen lassen können.

Die Mollusken der Umgebung von New-Philadelphia, O.

Von

Dr. V. Sterki.

Vielleicht interessirt es manche der geehrten Leser des Nachrichtsblattes, einige faunistische Mittheilungen aus der neuen Welt zu bekommen. Freilich leiden dieselben an verschiedenen Fehlern: einmal ist es nur ein sehr kleiner Umkreis, den ich durchsuchen konnte, und auch keiner der reichern; zudem war meine Zeit zum Sammeln eine beschränkte, und noch mehr zum Verarbeiten des Gefundenen. Ein anderer Mangel ist meine geringe Kenntniss der Arten sowie der Nordamerikanischen Fauna überhaupt. Trotzdem aber glaube ich, dass die folgenden Notizen wenigstens theilweise von Interesse sein werden, und wünsche, dass die kleine Musearbeit einigen Nutzen haben möge.

Die im folgenden zu besprechende Gegend liegt im östlichen Ohio, ungefähr in der Mitte zwischen Cleveland am Eriesee und Marietta am Ohio River, Städte, die wohl auf jeder Karte zu finden sind. Unser Hauptthal ist das des Tuscarawas River, der im allgemeinen von Norden nach Süden fliessend sich mit dem Muskingum vereinigt, einem nördlichen Zuflusse des Ohio. Der Fluss hat hier eine mittlere Breite von etwa 250 Fuss, ist nicht sehr tief, mässig raschen Laufes, im Sommer oft nur wenig Wasser führend, wo dasselbe nicht in natürlichen Bassins aufgestaut ist. Wie alle hiesigen Flüsse ist auch der Tuscarawas häufigen Ueberschwemmungen unterworfen, besonders im Frühling. Von beiden Seiten her fliessen Bäche oder Creeks, die, mit zahlreichen Serpentinen tief in den Thalboden eingegraben, oft vorübergehend massenhaft Wasser führen, im Sommer aber, wenigstens die mittlern und kleinern, fast austrocknen. Und doch findet man in den meisten derselben Najaden. Einige alte, nun abgeschlossene Flussläufe liegen im Sommer oft ebenfalls nahezu trocken; grössere Sümpfe finden sich nicht, eigentliche Moore gar keine. Ein Gewässer, welches noch Erwähnung verdient, ist der den Eriesee mit dem Muskingum resp. Ohio verbindende Ohio-Canal, zur Frachtschifffahrt benutzt und ziemlich reich an Mollusken.

Der mehr oder weniger flache Thalgrund ist beiderseits eingefasst von steil ansteigenden, vielfach unterbrochenen Hügeln von etwa 100 bis einigen 100 Fuss Höhe, mit gerundeten Kuppen oder grösseren welligen Höhenrücken. Vielerorts stehen die Hügel so nahe beisammen, und sind durch nach allen Richtungen einspringende Thäler und Thälchen so durchsetzt, dass sie ein förmliches Wirrwarr bilden und oft meilenweit kein ebener Platz zu finden ist. Der Grund gehört zur Kohlenformation, ist durchweg Sandstein, an steilen Gehängen stellenweise als kleinere Felsen anstehend, oder als grosse Blöcke gleich Findlingen herumliegend. Steinkohlen sind überall vorhanden, aber, da wir uns der Grenze ihres Gebietes nahe befinden, meist in wenig mächtigen Flözen. Wo dieselben nicht unter 3—4 Fuss haben, werden sie in Stollen abgebaut. Die Schichtung ist horizontal und die Thäler sind unverkennbar durch Ausspülung in sehr langer Zeit entstanden. Jüngere Ablagerungen ausser einer mächtigen Lage Flussgeschiebe fehlen in unserer Gegend durchweg, ältere sind nicht aufgeschlossen, so dass der geologische »Horizont« ein sehr engbegrenzter ist.

Die Abhänge und Höhen der Hügel, sind noch zu einem ziemlichen Theil mit Wald — Bush — bewachsen; doch geht die Ausrodung leider immer noch vorwärts und eine staatliche Ordnung und Beaufsichtigung fehlt bis jetzt, was nicht so sehr des Holzes, als vielmehr des Klimas wegen noth thäte. Nadelholz kommt hier gar nicht vor und nur in Gärten werden Föhren, Juniperus, Schierlingstannen (Abies canadensis) und europäische Fichten gepflanzt. Dafür sind die Laubbäume in sehr reicher Artenzahl vertreten, und viele davon erreichen eine ansehnliche Grösse. Krautpflanzen, perennirende und einjährige, gedeihen üppig und zeugen vom Reichthum des Bodens. Was dagegen spärlich vorhanden ist, sind Moose; den prächtigen grünen Teppich unserer heimathlichen Wälder sucht man hier vergebens; nur an feuchten und schattigen Stellen sind Steine und manchmal Holzstücke von ihnen überzogen, oder findet sich ein Büschchen auf dem Boden; an lebenden Baumstämmen fehlt es fast ganz — alles zum lebhaften Bedauern auch des Schneckensammlers.

Die Gras- und Krautvegetation, soweit sie in und neben dem fast durchweg angebauten freien Lande Platz findet, an Wegrändern und Hecken, hat viel Aehnlichkeit mit der mitteleuropäischen, was zum Theil davon abhängt, dass manche Pflanzen offenbar aus der alten Welt eingeschleppt sind, und sich völlig eingebürgert haben.

Sehen wir uns nun endlich nach den Mollusken um, so fällt uns gleich auf, dass die Landschnecken im allgemeinen spärlich vertreten sind, und zwar sowohl an Arten- wie namentlich an Individuenzahl. Als Gründe dafür liessen sich annehmen: der durchweg vorkommende Sandboden, die Trockenheit der Luft, spärliches Vorkommen von Moos etc. Allein das alles reicht nicht aus. — Kurze Zeit bevor ich die Schweiz verlies, sammelte ich noch einen Nachmittag (Juli 1883) am Garten, einem Molassehügel bei Bern, der klassischen Heimath des alten Studer*). Neben vielen andern fanden sich hunderte von Clausilien an den Sandsteinfelsen und Baumstämmen. Wie leer kamen mir dann hier die Felsen und Baumstämme vor, wo in der Regel auch nicht eine Schnecke zu finden ist, trotz alles Nachsuchens. Man vermisst sie doch sehr, die liebgeworden Clausilien und Pupen, für die hier drüben kein rechter Ersatz ist. — Also: der Sandstein allein thut's nicht. Kalkmangel kann auch nicht Ursache sein, denn alles Wasser ist sehr kalkhaltig; auch manche andere Momente könnten eher günstig wirken, so namentlich der Umstand, dass gefallenes oder gefälltes Holz meist in Menge ungestört liegen bleibt, und das sind denn allerdings auch die Plätze, wo der Sammler zum grössten Theil seine Beute findet. Ich habe mir Mühe gegeben, die wenige verfügbare Zeit und Gelegenheit möglichst gut zu benutzen, um das vorhandene aufzufinden, und habe bis jetzt kaum 50 Arten von Landschnecken gesammelt, einen grossen Theil davon nur in wenigen Exemplaren. Es liegt nicht in meiner Absicht, ein Verzeichniss der hiesigen Species zu geben, schon des-halb nicht, weil es vielleicht später doch noch zu ergänzen sein würde, namentlich wenn ich mein Nachsuchen auf eine etwas weitere Umgebung ausdehnen kann. Besser theile ich mit, wie und wo ich die betreffenden Arten angetroffen — gebe also Bericht über diese und jene Sammelexcursion.

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*) und des Jetzigen; einen Gruss auf diesem Wege!

Das Ziel derselben ist fast immer der Bush, die noch mit Wald bestandenen Abhänge der Hügel; mehr oder weniger dicht, mehr oder weniger feucht und schattig, das sind die Hauptunterschiede desselben. Im offenen Felde ist gewöhnlich nicht viel zu finden, obgleich alle Wege eingefasst, alle Grundstücke geschieden sind durch Hecken (Fenzen), aus Prügelholz erstellt, denen entlang Kraut und kleines Gebüsch oft ziemlich ungestört bleiben und faulendes Holz vielfach herumliegt. Es lohnt sich aber selten der Mühe, solches umzuwenden. Und doch versucht man's immer wieder; gelegentlich einmal findet sich eine *Helix fraterna* Say darunter, oder ein kleiner Limax, dem *L. agrestis* sehr ähnlich, ob mit ihm identisch, weiss ich nicht zu entscheiden, da mir die Hülfsmittel fehlen. Herr Heynemann wird das »ausmachen«, wie der Amerikaner sagt.*) Auch *Patula striatella Anth.* findet sich gelegentlich da. Wir überschreiten den Tuscarawas River und lassen uns durch seinen niedern Wasserstand nicht verleiten, nach Muscheln zu suchen, dies auf einen besondern Besuch versparend. Jenseits dagegen halten wir uns etwas auf: ein ebener, grasiger Platz, mit einzelnen Bäumen besetzt und eine Anzahl längst da liegender Stämme in Sicht, verspricht wenigstens etwas. Unter einigen der letztern, die wir umwenden, finden sich *Pupa contracta* Say und eine ähnliche kleinere Art, *Patula striatella* Anth., sowie einige *Hel. pulchella* Müll., die hier im ganzen selten ist. Manche Amerikaner wollen nun auch eine besondere neue Art aus ihr machen, obschon sie nach meiner Ansicht in nichts von der europäischen abweicht. (Hel. costata habe ich noch nicht gesehen.) Auch *Hyal.* (?) *lineata* Say*) findet sich in wenigen Exemplaren, und eine alte, werthe Bekannte: *Hyal. radiatula* Ald., sowie *Hyal. fulva* Müller, die beide im ganzen nicht gerade selten sind. Am Fusse des vor uns liegenden ziemlich steilen Hügels wird der Baumwuchs dichter, der Boden ist mit Laub bedeckt; auch hier sind noch einzeln die zuletzt erwähnten Arten, daneben nun auch andere und grössere, im Laub sowie unter und in halbfaulem Holze, das wir freilich mit einiger Vorsicht umwenden — denn der Copperhead (Ancistrodon contortrix Z.), eine gefährliche Giftschlange, die immer noch gelegentlich neben der hier auch schon seltenen Klapperschlange vorkommt, liebt gerade solche Wohnplätze und beisst schnell zu, wenn in ihrer Ruhe gestört. Hier sammeln wir *Hyal. arborea* Say und *intertexta* Binn., *Macrocyclis concava* Say, *Zonites fuliginosus* Griffith, *Patula perspectiva* Say, die häufigste unserer Landschnecken, deren Individuenzahl an solchen Plätzen vielleicht derjenigen aller andern zusammen genommen gleichkommt, während sie an offenen Stellen oft fast gänzlich fehlt; *Patula alternata* Say, meist in kleinen, unansehnlichen Exemplaren, *Helix hirsuta* Say, *fraterna* Say, *tridentata* Say, darunter gelegentlich ein Albino, *albolabris* Say, oft mit rosenrother Lippe, wenn frisch, *solitaria* Say mit ziemlich kleinen aber reichlich bebänderten Gehäusen; sie ist nicht häufig und ebenfalls selten finden sich: *Hel. inflecta* Say und *thyroides* Say. Die dritte Form dieser Gruppe, *Hel. exoleta* Binn., habe ich hier noch nicht gesehen. Auch *Hel. fallax* Say findet sich gelegentlich an solchen Orten, doch mehr an offenern Plätzen; wer die beiden nicht gut kennt und genau zusieht, sammelt diese und *Hel. tridentata* als nur eine Art. Unter der Rinde und in sonstigen Hohlräumen faulender Stämme findet sich nicht selten eine Nacktschnecke von hellröthlichgrauer Färbung und dunkler fleckiger Zeichnung deren Schild den ganzen Rücken bedeckt, bis 6 Cm. lang, ein ausserordentlich träges, langsames Thier, das bei Berührung sich mit weissem Schleim bedeckt — es ist wohl *Philomycus* und nach äussern Verschiedenheiten und solchen der Radula scheinen mir 2 Arten vorhanden zu sein.*)

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*) L. campestris. — Sterki in litt.

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*) Ist sicher eine Helix. — Sterki in litt.

Ausgeschüttelten Mulm aus den massenhaft am Boden liegenden Blättern, sowie unter und aus faulendem Holze, nehmen wir mit uns nach Hause.

An manchen Stellen finden sich leere, angebrochene Gehäuse von *Macrocyclis concava* und *Hel. tridentata*, auch von *Patula alternata* zu 1—2 Dutzenden beisammen an Häufchen unter dem Laube, wahrscheinlich von einer Spitzmaus (wohl Sorex oder Blarina brevicauda) ausgeraubt; eine Raubschnecke kann der Missethäter nicht sein, schon weil hier keine solche bekannt ist, und dann weil die geleerten Gehäuse ja nicht beisammen liegen würden. — An einer dicht mit Kraut bewachsenen Stelle am Rande des Waldes finden wir unter Laub einige Exemplare des hübschen *Zonites gularis* Say, den wir an vielen Plätzen vergebens suchen. Unter Bäumen im Grase lesen wir noch einige Hel. hirsuta Say und fraterna Say heraus, und wenden uns dann seitwärts dem Canale zu, dessen Spiegel wie Sohle hier über dem Niveau des umgebenden Landes liegen. Da und dort sickert etwas Wasser durch und hält den Damm nass. An einer solchen Stelle finden wir im hohen Grase um einen faulen, zum Theil bemoosten Baumstamm ungefähr ein Dutzend Exemplare von *Hyalina nitida* Müll.

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*) Es sind *Ph. carolinensis* und *dorsalis*, schwerlich zu einer Gattung gehörend. Sterki.

und gleich dabei etwas neues: *Pomatiopsis lapidaria* Say, eine Pneumonopome, die ich sonst noch nirgends gefunden.

Doch es ist Zeit, den Rückweg anzutreten. Im Vorbeigehen besuchen wir noch auf ein paar Minuten einen kleinen Sumpf; an den herausgezogenen Blättern einer gelben Seerose finden sich einige Exemplare von *Valvata tricarinata* Say, einige kleine, unbekannte Planorben nebst 1 Exemplar von *Pl. albus* Müll., einige Stücke einer kleinen *Rissoide* und ein paar sehr kleine längliche Ancylen. Damit geben wir's für heute auf, wohl zufrieden mit der Ausbeute, die bei andern Gelegenheiten eine recht spärliche war.

Eine ähnliche Excursion machen wir thalabwärts nach einem vielversprechenden bewaldeten Hügel. Unser kürzester Weg ist die Bahnlinie, die auch sonst einige gute Plätze berührt. Am Ufer eines alten Wasserlaufes im Grase finden sich einige — zwar leere — Gehäuse von *Hyal. ligera* Say und *Hel. fallax* Say; von ersterer endlich auch ein paar gute lebende Stücke unter Holz. Zu unserer Ueberraschung liegen unter einem alten Stiefel, den wir umwenden, etwa 30 Exemplare von *Patula striatella* Anth. in Gesellschaft von einigen *Hyal. arborea* Say — eine neue Mahnung an die Art, wie man den Schnecken am besten »Fallen« legt. — Einige fast ausgetrocknete sumpfige Stellen versparen wir auf den Heimweg und eilen unserem Ziele zu, einem sehr steilen, theilweise felsigen Abhang, mit Bäumen und Busch reich bewachsen und mit moosigen Stellen: mehr als zweistündiges mühsames Herumklettern und Nachsuchen ergab sehr geringe Ausbeute: wenige Macrocyclis concava und Hel. tridentata, aber 4 schöne ausgewachsene Exemplare von *Hel. profunda* Say, die hier jedenfalls selten ist, und ein halbgewachsenes Stück, das bei näherm Anschauen von *Hel. palliata* sein muss, hier durchaus spärlich vorkommend. Damit und mit einem

Säckchen voll Mulm müssen wir uns zufrieden geben, welche Zufriedenheit in der Folge auch beim Aussuchen der Minutien in erhöhtem Maasse begründet wird, denn es finden sich da u. a. *Hyal.* (?) *labyrinthica* Say, einige hübsche *Pupen* und eine *Cionella*, die der C. lubrica Müller mindestens sehr ähnlich sieht, endlich *Carychium exiguum* Say, was wohl nichts anderes ist, als C. minimum Müller; aber alle diese Arten nur in sehr wenigen Exemplaren. Auch eine *Succinea* treffen wir gelegtlich dabei, der Var. humilis Drouet von S. oblonga Drap. — soweit sie mir im Gedächtniss geblieben — mindestens sehr ähnlich, und wie diese, mit Schmutz überzogen, aber in so auffallender Weise, wie ich es bei jener nie gesehen: der dunkle Ueberzug erhebt sich auf dem Rücken der Umgänge in regelmässigen Abständen zu Spitzen, sodass eine ganze Spiralreihe solcher Schmutzhäufchen zu sehen ist. Es ist somit klar, dass dieser Ueberzug sich nicht von selbst an das Gehäuse anhängt, sondern vom Thiere mit Hülfe seines Schleimes »absichtlich« in dieser sonderbaren Weise gebildet wird.

Es sei mir gestattet, einige Bemerkungen über die hiesigen Minutien überhaupt später nachzuholen. Einerseits sind bis jetzt nicht alle bestimmt, und andererseits dürften sich wohl noch einzelne dazu finden. — Dagegen mag hier noch bemerkt werden, dass zu denselben mindestens $^2/_3$ unserer Landschnecken zählen.

Wir haben noch den Rückweg unserer Excursion vor uns, und die Aussicht, eine Anzahl Wasserschnecken zu sammeln. An den erwähnten, im Austrocknen begriffenen Plätzen finden sich, meist in todten, leeren Exemplaren: *Planorbis trivolvis* Say, *bicarinatus* Say, *campanulatus* Say, *exacutus* Say, und (Segmentina) *armifer* Say, nebst einigen kleinern Pl.-Arten. Daneben eine lange, schlanke und spitzige Var. von Limnaea palustris Müll. (nach meiner Ansicht); sie wurde mir als L. Kirtlandiana Lea bestimmt.

Physa beterostropha Say ist hier wie anderwärts häufig. Von Cycladiden fanden sich: *Sphaerium transversum* und (Calyculina) *partumeium* Say, sowie einzelne kleine Pisidien. An einer andern Stelle, aber nur an dieser, machen wir einen sehr interessanten Fund: Eine Limnaea, wohl Form von L. palustris, mit starker Lippe, (ziemlich gleich der von Helix incarnata). Gehäuse für die Art klein, spitz thurmförmig, Spitze scharf. Umgänge 6, mässig gewölbt. Mündung relativ nicht weit, obschon von ziemlich halber Höhe des Gehäuses; Nabelritz deutlich, aber eng, Spindel wenig vortretend; Umschlagsfalte nicht breit, ziemlich stark; Mundsaum gerade, innen der ganzen Länge nach mit gleichmässiger, starker, blassrother Lippe belegt. Schale mit feiner Sculptur, die gegen die Mündung zu an einzelnen Exemplaren einige leichte Kanten hervortreten lässt. Höhe 15—18, Durchm. 5,5—6 mm; Mündung: Höhe 7,5—8, Breite 4—4,5. — Bis jetzt habe ich nur leere Schalen gefunden, aber einige Dutzende derselben, und alle übereinstimmend. Lebende werden sich auch noch finden. Sie scheint eine locale Varietät von *Limn. palustris* Müller zu sein, aber eine der interessanteren. Herrn Meeres in Columbus, der eine grosse Sammlung besitzt, war die Form gänzlich unbekannt. Sollte sie überhaupt noch nicht bekannt und nirgends beschrieben sein, so hätten wir sie wohl mit dem Namen *var. labiata* zu belegen.

In der Gesellschaft der vorgenannten Arten findet sich noch eine *Limnaea*, die mir als *desidiosa* Say bestimmt wurde; mir scheint sie nichts anderes als eine ziemlich grosse, schlanke Var. von *L. truncatula* Müller zu sein; von einem andern Platze unserer Umgebung stammt eine kleinere Form, die ich zu derselben Art zähle; sie wird als *L. humilis* Say bezeichnet. — Auf Wasserpflanzen, Holz etc. hält sich nicht ganz selten eine kleine, zarte Succinea auf, der Schale nach ähnlich mit S. Pfeifferi, aber kleiner, das Thier heller. Eine andere etwas grössere, bauchigere S. fand ich in wenigen leeren Exemplaren, um ihrer bei der Gelegenheit zu erwähnen. Unter Holz erbeuten wir ebenda einen kleinen dunklen *Limax*, vielleicht *laevis* Müller, aber er ist nichts weniger als häufig, und man kann oft lange vergebens nach ihm fahnden.

Ein Theil dieser jetzt fast ausgetrockneten kleinen Sümpfe sind durch Kiesausgrabungen längs des Bahndammes entstanden und also verhältnissmässig jungen Datums. Und doch finden wir in einem derselben eine ganze Anzahl von Anodonten, allerdings in Folge Wassermangels nur die leeren Schalen; es scheint mir eine kleinere Form von *A. plana* Lea zu sein.

Dem Flusse widmen wir einen speziellen Besuch. Im Kies und Sand am Ufer finden sich stellenweise verwitterte, zerbrochene und abgerollte Muschelschalen in Menge; daneben auch Schnecken: *Melantho integra* Say, von der linksgewundene Exemplare nicht gerade selten sind; eine *Goniobasis*-Art, wahrscheinlich *exilis*, die wir im River selbst auf Steinen zu Tausenden sammeln können, während die erstgenannte dort nicht so leicht zu bekommen ist. Auch einzelne stark abgeriebene und zerbrochene Gehäuse von *Pleurocera labiata* Lea (?) liegen im Kies; nach lebenden Exemplaren im Fluss habe ich bis jetzt vergebens gesucht; jedenfalls ist sie hier nicht so häufig, wie sie und ihre Verwandten in manchen andern Flüssen sich finden. Bei genauerm Zusehen entdecken wir im Sande noch 2 etwas verwitterte Gehäuse von *Somatogyrus isogonus* Say, die jedenfalls auch nicht häufig ist. An Steinen und Holz im Wasser lebt ziemlich zahlreich *Physa gyrina* Say, und *Ancylus diaphanus* Hald. Ausser den genannten und einzelnen *Limnaea truncatula* Müller fand ich im Flusse sonst keine Schnecken.

Sphaerium striatinum Lam. und *transversum* scheinen nicht gerade selten zu sein. — Es mag hier bemerkt werden, dass ich die hübschen stark concentrisch gestreiften *Sph. sulcatum* Lam. und *stamineum* Conr. in unserer nähern Umgebung noch nicht gesammelt habe, doch dürften sie zweifellos vorkommen. — Ein einzelnes Stück von *Melantho rufa* Hald. fand ich in einem kleinen Canal in der Nähe des Flusses, und dürfte die Art vielleicht nicht zu selten sein.

Werfen wir noch einen Blick auf einen Haufen alter Anschwemmungen vom Fluss. Da finden sich mehrere Exemplare von Hyal. ligera Say, ein ganz verwittertes Gehäuse von Hel. profunda und ein zerbrochenes von *Hel. multilineata* Say, alles was von dieser Art in der Gegend bis jetzt zu finden war. Noch einige *Pupa armifera* Say lassen sich sehen, aber in so brüchigem Zustande, dass die Hoffnung, kleinere Pupen, Hyalinen etc. auszulesen, aufgegeben werden muss. — Soweit ich bis jetzt gesehen, sind Schnecken im angeschwemmten Genist überhaupt nicht besonders häufig.

Nun zu den Najaden! Im Tuscarawas River hat sich trotz dessen nicht beträchtlicher Grösse ein ziemlicher Reichthum an Muscheln entwickelt. Dabei ist wohl von Bedeutung, dass vom Ohio aufwärts kein Wasserfall etc. vorhanden ist, sowie dass die jetzige Configuration, oder wenigstens mit geringen Veränderungen, seit (geologisch) sehr langer Zeit dauert. Eigenthümliche Arten scheinen indessen zu fehlen; doch dürfte die unten unter Nummer 4 c. aufgeführte Form besonderes Interesse beanspruchen.

Den Boden bildet meist grober Kies und nur bei Hochwasser lagern sich an ruhigen Uferstellen feiner Kies und Sand ab. — Als ich zuerst hieher kam — den Najadenreichthum der nordamerikanischen Flüsse kannte ich nur vom Hörensagen — sah ich auf einer kurz vorher überführten Strasse im Kies eine Menge von Unio- und Anodontenschalen. Natürlich hatte ich nichts eiligeres zu thun, als mir eine Anzahl der bessern auszusuchen, allerdings mit dem Gedanken, an der Quelle selbst mehr und besseres zu holen. Im Flusse sind sie aber nicht so leicht zu sammeln, namentlich die kleinern Arten. Bei niederm Stande und klarem Wasser sieht man allerdings manches Stück, namentlich von Unio ligamentinus Lam., verrucosus Raf., coccineus Lea c., gibbosus Barns etc. Will man mehr, so braucht es viel Zeit und Mühe. Am Ufer liegen überall leere Schalen herum, aber selten in gutem Zustande. Wahrhaftes Staunen bemächtigt sich indessen des Neulings, wenn er an Plätze kommt, wo Tausende und Tausende solcher Muscheln herumliegen, wo man keinen Fuss hinsetzen kann, ohne auf dieselben zu treten. Es war im Herbst 1883, als ich zuerst diesen Reichthum sah, und, da der Ort in der Nähe der Stadt war, mehrfach besuchen konnte. Es zeigte sich bald, dass die Muscheln durch Ueberschwemmung und zwar, wenigstens zum grossen Theil, in lebendem oder doch ziemlich frischem Zustande ausgeworfen sein mussten: bei den meisten hingen die Schalen noch zusammen oder waren doch in der Nachbarschaft und sahen bei manchen noch ziemlich gut aus. Der Umstand, dass viele derselben im Kies oder im Gebüsch steckten, offen, den Rücken meist thalaufwärts gewendet, lässt aber auch erkennen, dass von einer frühern Ueberschwemmung ausgeworfene, leere Muscheln von einer spätern in diese ihre Lage gebracht waren.

Im folgenden März (1884) sah ich dann selbst eine solche Ueberschwemmung; da das Wasser ziemlich rasch fiel und kühles Wetter herrschte, war ein grosser Theil der Tausende von Muscheln, die am Ufer zurückblieben, frisch und lebend. Ich gab mir denn auch redliche Mühe, das vorhandene Material nach Möglichkeit zu benutzen und zu sammeln. Da gab es Gelegenheit, die Arten in ihren »Normalformen« kennen zu lernen, sowie in ihren Jugendzuständen, im hohen Alter, in mancherlei Abweichungen, Monstrositäten etc. Von den meisten Arten fanden sich auch ganz junge Stücke, die man ohne Zwischenstufen und ohne genaue Vergleichung oft kaum richtig zu deuten im Stande wäre. Auch über die Häufigkeit und Seltenheit der Arten konnte ich mich ziemlich orientiren. Eine zweite Ueberschwemmung kurze Zeit nachher brachte mir in mancher Beziehung Bestätigungen und Ergänzungen; seitdem ist aber keine solche mehr eingetreten, und ich beschränkte mich darauf, im River selbst gelegentlich zu sammeln, und sah von neuem, um es zu wiederholen, wie armselig an Ergebnissen dieses Sammeln meist ist. Indessen hat es auch sein Gutes: man sieht, wo diese und jene Art sich aufhält, wie sie lebt, und in welcher Gesellschaft. Allein viele Arten, die ich unter den ausgeworfenen fand, suchte ich nachher vergeblich, und es war auch gleich dort zu erkennen, dass sie einerseits sehr selten sind und andererseits weiter herkommen müssen, vielleicht aus einem entferntern Zuflusse; das ist dann allerdings nicht oder nur mit Schwierigkeit zu entscheiden; allein die Zugehörigkeit zum — und ja nicht sehr grossen — Flussgebiet unterliegt doch keinem Zweifel.

Auch im Ohio-Canal habe ich mich etwas umgesehen, und darin meist dieselben Arten gefunden, wie im River, aber nicht alle, und die vorkommenden waren deutlich von jenen verschieden, was durch die Verschiedenheit des Bodens sich erklärt: hier Sand und Schlamm, dort Kies; hier sehr langsamer oder fast kein, dort immerhin rascherer Lauf. Eine Art die ich nur hier fand, ist der sehr zarte U. parvus Barns. (S. unten No. 24.) Auch eine Anodonta-Form (A. Ferussaciana?) fand sich dort, die ich im River und seinen Anschwemmungen vergebens suchte.

Ich lasse hier ein Verzeichniss der gefundenen Arten folgen und füge allfällige Bemerken bei. Die Formen sind in jeder der drei Gattungen — Unio, Alasmodonta und Anodonta — nicht nach ihrer Verwandtschaft, sondern nach der Häufigkeit ihres Vorkommens geordnet; die Namen sind so, wie sie mir von einem amerikanischen Sammler bestimmt wurden.

1. *Unio ligamentinus Lam.*, mit sehr dicken und schweren Schalen; eine grosse Menge von jungen Exemplaren angeschwemmt. Variirt wenig.
2. *U. luteolus Lam.* Junge mit zahlreichen lebhaft grünen Strahlen, die nach und nach verschwinden. Die Exemplare des Ohiocanales sind im allgemeinen etwas grösser, brauner und so glatt, dass kein gummirtes Schildchen nach dem Trocknen daran haften bleibt.
3. *U. gibbosus Barns.* Einzelne Exemplare mit hellgelbem oder weissem Perlmutter (statt dunkelviolettem). An vielen der ältern Stücke ist das Schloss schadhaft, indem übergelagerte Häute die Entwicklung namentlich der Cardinalzähne hindern.
4. *U. coccineus Lea. var. a.* Schale sehr dick im Verhältniss zur Grösse der Muschel, Wirbel stark vorspringend. Perlmutter meist roth, am Hinterende prachtvoll irisirend; Grösse sehr verschieden.

   Var. b. Kleiner, flach, dünn; Wirbel sehr wenig vorspringend; Perlmutter wie bei voriger, selten gelb oder weiss.

   Var. c. ? Gross bis sehr gross; Schalen sehr dick und schwer. Perlmutter immer rein weiss. Weicht von früher Jugend an von den vorigen beiden Varr. bedeutend ab. Ein Urtheil betreffs der Art- oder Var.-Frage steht mir indessen noch nicht zu.
5. *U. subovatus Lea.* Perlmutter meist rein weiss und von prachtvollem Glanze, bei manchen Expl. in der Nähe des Schlosses rosafarben; an einem grossen, sehr schönen Stücke ist es durchweg ganz gleichmässig

rosenroth. — Die Schale hat die unangenehme Eigenschaft, dass sie beim Trocknen Sprünge bekommt. Junge Exemplare finden sich ziemlich selten, sind sehr dünnschalig und zart, aussen meist röthlich. Manche Muscheln werden ungemein alt; ich habe lebende Stücke gesehen, wo das Schloss defect und aus den Fugen war, und die sehr abgeriebenen, theilweise am Rande ausgebrochenen Schalen nur durch das ebenfalls altersschwache Band zusammenhielten.

6. *U. plicatus Lea.* Manche Stücke sehr gross und schwer; die Exemplare vom Ohiocanal durchweg kleiner, deren Epidermis von feinen Schuppen seidenglänzend; dasselbe gilt von No. 11.

7. *U. phaseolus Hildr.* Die alten Muscheln haben rel. dickere und schwerere Schalen, als irgend eine andere Art. Die Epidermis zeigt nicht den feinen Seidenglanz, wie die von Exemplaren aus dem Scioto R. (Ohio). Ganz junge Stücke sind lang und schmal, die Schale sehr dünn.

8. *U. circulus Lea.* Bei fast allen ausgewachsenen Stücken sind die Schlosszähne verkümmert und von einer braunen körnigen Masse überzogen.

9. *U. verrucosus Raf.* (tuberculatus Barns) 5—10 Cm. lange junge sind häufig; ganz kleine habe ich nicht gesehen.

10. *U. rectus Lam.* Junge Exemplare haben schön rothes Perlmutter, welche Färbung bei den erwachsenen ganz verschwunden ist.

11. *U. flavus Raf.* Ohiocanal in Menge (vide No. 6.); differirt stark in der Grösse; im Fluss ziemlich häufig.

12. *U. irroratus Lea.* Die einzige ihrer Gruppe. Perlmutter weiss bis röthlich.

(Schluss folgt).

Diagnosen neuer Portugiesischer Landschnecken.

Von

Hermann Freiherrn von Maltzan.

Helix Strucki n. sp.

aff. H. caperatae Mtg., sed differt apice obtusiore, umbilico dimidio minore, t. minus acute costulata, apert. minus alta.

T. orbiculato-depressa, angustissime umbilicata vel perforata, solidiuscula, alba, ad suturam maculis pellucidis, ad peripheriam fascia interrupta fusca, ad basin fasciis angustis indistinctis ornata, spira convexo-conica, apice obtusulo. Anfr. 6 arcte involuti, ultimus fere subcarinatus. Apert. parum obliqua, transverse ovalis, intus callose albo labiata, perist. simplex, acutum, marginibus valde separatis.

Alt. $5^1/_2$—$6^1/_2$, diam. $8^1/_2$—$9^1/_2$ mm; alt. apert. $4^1/_2$, lat. apert. $5^1/_4$ mm.

Hab. Almadena et St. Vincent, Algarve (Portugal).

Subgen. Rhaphidiella gen. Caecilianellae Bgt.

Differt a gen. Caecilianella Bgt. testa claviformi, anfr. lente accrescentibus, collumella valde sigmoidea, exciso torta, margine supero hujus excisurae in media parte parietis dentiformi modo aucto. Columella basi non truncata, in marginem dextrum gradatim defluens.

Caec. Barbozae n. sp.

T. minima, elongato-claviformis, spira cylindrato-turrita, apice acutiusculo. Anfr. 6, lente accrescentes, sutura subimpressa, submarginata disjuncti, ultimus vix $^1/_3$ omnis altitudinis testae aequans. Apert. elongato-piriformis, basi fere biangulata; columella concava, superne unidentata, basi angulo fere recto in marginem dextrum transiens.

Alt. 3, lat. $^3/_4$ mm; alt. apert. 1, lat. apert. $^1/_2$ mm.
Hab. Portimao, Algarve (Portugal).

Terebrella subg. Caecilianellae Bgt.

Differt a gen. Caecilianella Bgt. columella sub media parte noduloso-callosa, aut uni-aut binodulosa, nodulo supero, si adest, dentiformi, infero oblique elongato, distincte a truncatura columellae sinulo separato, introrsum evanescente. Typus C. Clessini n. sp.

Caec. Clessini n. sp.

T. elongato-turrita, spira turrita, apice acutiusculo. Anfr. 8, lente accrescentes, sutura marginata disjuncti, ultimus $^1/_3$ omnis altitudinis testae aequans. Apert. compressa, lanceolata; columella sub medio cultriformi-unicallosa, basi oblique et acute truncata.

Alt. $7^1/_4$, diam. $2^1/_8$ mm; alt. apert. $2^1/_2$, lat. apert. 1 mm.
Hab. Portimao et Tavira, Algarve (Portugal).

Caec. binodosa n. sp.

T. oblongo-fusiformis, media parte latissima, fere biconica spira elongato-conica, apice obtuso. Anfr. 5, lente accrescentes, sutura marginata disjuncti, ultimus spira major. Apert. elongato-lanceolata, marginibus fere parallelis, columella binodosa, nodulo supero dentiformi, fere horizontali, infero magno, obtuso; truncatura columellae distincta, horizontalis.

Alt. $2^5/_8$—$2^3/_4$, diam. 1 mm; alt. apert. $1^5/_8$, lat. apert. $^1/_2$ mm.
Hab. Portimao, Algarve (Portugal).

Observ. Cognoscimus specimen unicum, majus, ejusdem staturae et formationis columellae, sed unicallosum, callum inferum solum exhibens; alt. $3^1/_2$ mm.

Kleinere Mittheilungen.

(**Ein neuer Austernfeind**) ist auf den Austerbänken in Neusüdwales beobachtet worden in Form einer bohrenden Annelide (*Leucodore ciliata* Hasw.) welche die Schalen zerstört und dadurch den Tod der Auster herbeiführt.

(**Austernkultur**). Eine äusserst sinnreiche und bequeme Methode, die Austerembryonen aufzufangen, gibt John A. Ryder in Science No. 147. Die trächtigen Austern werden in einen Teich gebracht, welcher durch einen längeren gewundenen Kanal mit dem offenen Meere zusammenhängt und somit an der Bewegung von Ebbe und Fluth theilnimmt. Ein Teich von 40′ im Quadrat genügt für 100 Bushels Austern, die man in zwei Schichten übereinander anbringen kann In den Kanal werden Rahmen von 3 Fuss Länge und Breite und 6″ Tiefe eingehängt, welche man durch Ueberspinnen mit einem Netz von galvanisirtem Eisendraht in Körbe umgewandelt hat, von denen jeder circa 3 Bushel leerer Austernschalen aufnehmen kann. Da für einen solchen Korb ein laufender Fuss Kanal genügt, kann man in einem Kanal von 400′ Länge ebensoviel Körbe anbringen und somit den jungen Austern 1200 Bushels Schalen zur Anheftung darbieten, an denen sie während der 90tägigen Laichzeit täglich viermal durch Ebbe und Fluth vorbeigeführt werden. Ansammeln von Schlamm und Unreinigkeit ist durch Schütteln der Körbe leicht zu vermeiden, und wenn die Laichzeit vorüber ist, braucht man die Embryonen nicht vom Sammelapparat abzubrechen, sondern kann sie mit den Schalen, an denen sie sitzen, ganz nach Belieben an geeigneten Stellen ausstreuen.

Literatur.

Översigt öfver de af Vega-Expeditionen insamlade Arktiska Hafsmollusker. II. Placophora och Gastropoda af Carl W. Aurivillius. — Aus Vega-Expeditionens vetenskapliga Jaktagelser, Bd. IV. p. 313—383. 2 Taf.

Von den 67 im Beringsmeer gesammelten Arten sind 40 mit den acktischen Meeren gemeinsam, 27 eigenthümlich. Als neu beschrieben werden: Turritella erosa var. costata p. 323 t. 12 f. 8; — var. declivis p. 324 t. 12 f. 9; — Trichotropis solida p. 328 t. 12 f. 16; — Buccinum angulosum var. laevis p. 336; —

B. groenlandicum var. inflata p. 338; — B. ovum var. angulata p. 339; — Bela bicarinata var. exserta p. 347; — Pleurotoma Beringi p. 354 t. 13 f. 3. — Euthria conulus p. 354 t. 13 f. 6; — Fusus decipiens p. 356 t. 13 f. 4, 5, 13; — F. Kroyeri var. grossestriata p. 360; — F. fornicatus var. conica p. 361; — var. intermedia p. 361; — var. devexa p. 362; — var. multistriata p. 363; — Sipho turritus p. 365 (der Name wegen der gleichnamigen Sars'schen Art unannehmbar); — S. olivaceus p. 366 t. 13 f. 10; — S. islandicus var. insculpta p. 368; — Philine polaris p. 371 t. 12 f. 21, 22; t. 13 f. 18; — Doris (Adalaria) sibirica p. 372 t. 13 f. 19; — Tritonia psoloides p. 373 t. 13 f. 20. — Der Autor scheint die Monographien von Buccinum und Neptunea in der neuen Auflage des Martini Chemnitz nicht zu kennen, hat sie wenigstens nirgends berücksichtigt.

Brusina, Prof. Spiridion, über die Molluskenfauna Oesterreich-Ungarns. — In Mitth. naturw. Vereins Steiermark Jahrg. 1885.

Der Autor hat sich der dankenswerthen Aufgabe unterzogen, die dem österreichisch-ungarischen Gebiete eigenthümlichen Arten zusammenzustellen. Für die marine Fauna der Adria nimmt er 18 eigenthümliche Arten an, die Landfauna dagegen ergibt — Dank Dalmatien und Siebenbürgen — die stattliche Anzahl von 447. — Für Hel. Hauffeni wird eine eigene Untergattung ***Spelaeodiscus*** vorgeschlagen. Ausserdem wird eine neue Limnaeidengattung ***Sandria*** (Zrmanjae Brus. n.) aus dem Genist des Zrmanja-Flusses genannt, aber nicht näher charakterisirt. An neuen Namen werden ferner eingeführt: Pseudamnicola Clessini für Assiminea adriatica Clessin; — Vitrella Hauffeni für Pal. pellucida Hanffen nec Benz; — V. Zelebori für Pal. pellucida Parr. nec Benz aus den Anspülungen des Wienflusses.

Martens, Ed. von, Conchologische Mittheilungen. Zweiter Band, Lfg. 5 und 6.

Enthält: 1. Binnenconchylien aus Südamerika von A. Stübel. Neu: Helix (Isomeria) scalena p. 170 t. 31 f. 1—3 aus Neu-Granada; — Bulimus (Dryptus) Stübeli p. 172 t. 32 f. 5—7 von Neu-Granada; — Hemibulimus n. subg. auf Liguus excisus n. (= Achatina magnifica Pfr.) p. 173; — Otostomus millegranus p. 177 t. 32 f. 1—4 von Balzas in Ostperu; — Limnaea nitidella p. 178 t. 35 f. 16, 17 aus Ecuador. — 2. Binnenmollusken aus Mittel- und Ostasien. — Neu Hel. oscitans p. 180 t. 33 f. 1—3 Japan. Ferner werden abgebildet Hel. flocculus Mor. p. 179 t. 33 f. 7-9; — Hel. Sarelii Mts. t. 33 f. 4—6; — Bul. dissimilis t. 33 f. 13—18; — Succinea chrysis Westerl. t. 33 f. 19—24; — Physa hypnorum var. polaris Westerl. und var. picta Krause t. 33 f. 28, 29 und f. 25—27. — 3. Landschnecken aus dem Mittelmeergebiet. Neu Hel. eremophila var. Amunensis p. 185 t. 35 f. 6—10 vom Dschebel Amun zwischen Kairo und Suez; — ferner abgebildet Hel. Cyrenaica Mts. t. 31 f. 4—7. — 4. Afrikanische Binnenmollusken. Abgebildet Limicolaria subconica Mts. t. 34 f. 3, 4 Chinchoxo; — L. Martensiana var. elongata t. 34 f. 1, 2 Niangwe; — Spatha sinuata t. 34 f. 5, 6 Congogebiet. — 5. Ueber Bulimulus und Otostomus. Gibt eine Zusammenstellung der nach ihrer Mundbewaffnung bekannten Arten; für B. altoperuvianus und eine neue Art wird die Untergattung Neopetraeus errichtet. — 6. Schacko, G., Beschreibung von Kiefer und Radula einzelner Arten. Gibt die Mundbewaffnung von Orthalicus irroratus Rve., Liguus magnificus Pfr., Bul. caliginosus, culmineus; Bulimulus Hennahi Gray, Otostomus Sachsei Alb., Otostomus (Neopetraeus) millegranus Mts. n. —

Gredler, P. Vincenz, zur Conchylien-Fauna von China. VIII. Stück. Bozen, Selbstverlag. 8⁰. 19 p.

Als neu beschrieben werden Hyalina crystallodes p. 3; — Kaliella rupicola var. grandis p. 4; — Helix (Polygyra) Hensamensis p. 4; — (Fruticotrochus) trochacea p. 6; — Pupa angulina p. 7; — Stenogyra pachygyra p. 9; — Pupina Fuchsi p. 9; — Bithynia Paeteli p. 13; — B. minutoides p. 14.

Mittheilungen und Anfragen.

F. Wiegmann in Jena

wünscht für die anatomische Untersuchung die nachstehend verzeichneten Clausilia-Arten entweder in lebenden, resp. Weingeist-Exemplaren, oder doch wenigstens in nicht zu alten Gehäusen mit eingetrockneten Weichtheilen:

Aus der früheren Gruppe Baleo-Clausilia.

Cl. Haueri Bz.
— pomatias Pfr.
— *glauca Bz.*
— bogatensis Bz.
— glorifica Rm.
— livida Mke.

Vertreter der Gruppe Triloba v. V.
„ „ *Herilla Boettg.*

Ferner Cl. Parreyssi Rm. oder var. cerata Rm.
— transiens v. Mölld.
— Küsteri Rm.
— Meissneriana Shutt.
— gibbula Z.
— stigmatica Z.
— piceata Z.
— Stentzi Rm.
— Balsamoi Str.
— conspurcata Jan oder Verwandte.
— binodata Z., numidica Bt. oder Verw.
— laevissima Z., cattaroensis Z.
— subcylindr. oder Verw.
— robusta Küst. oder Verw.
— crassilabris Kstr., bilabiata Wagn. od. Verw.
— dalmatica Partsch od. Verw.
— sulcosa Wagn., regularis Parr. od. Verw.

Vertreter der Gruppe Cristataria v. V.
„ „ *Albinaria in den versch. Typen.*
„ „ *Carinigera.*

Ferner Cl. Syracusana Phil.
— isabellina Pfr.
— venusta A. Sch.
— saxicola Parr.
— rubicunda Kstr.
— virgata Jan.
— succineata Z.
— diodon Stud.

Vertreter der Gr. Phaedusa.
„ „ *Serrulina.*

Ferner Cl. fallax Rm.
— elata Z.

Vertreter der Gr. Mentissa z. B. detersa Z.
„ „ *Euxina* (hetaera, moesta).

Ferner Cl. vetusta Z.
— varnensis Friv.
— brunnea Z.
— bicarinata Z.
— corynodes Held.
— filograna Z.
Vertreter der Gr. Laminifera.
„ „ Olympia.
„ „ Nenia.

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18 continued

Namen versandt. Sie war übrigens ziemlich einzeln und ausgewachsene Exemplare fanden sich nur ganz wenige. Mit grossen Erwartungen kletterten wir den steilen Hang des Hauptberges hinauf, einem anderen mächtigeren Felsenkamm zu; es war keine Kleinigkeit, da die eckigen Steine einem fortwährend unter den Füssen wichen, und als wir oben ankamen, fand sich auch nicht das geringste Neue und die unten schon beobachteten Arten nur in ganz wenigen Exemplaren. Für die Anstrengung entschädigte freilich reichlich die prachtvolle Aussicht. Auf einem steilen Fusspfade kletterten wir wieder ins Thal hinab; unten fanden wir zu unserer Verwunderung den Abhang mit Zwergpalmen bewachsen, das einzigemal, dass uns diese Pflanze in Tunis begegnete.

Nach dem Frühstück ging ich noch einmal einem in geringer Entfernung vom Badedorf in die Ebene vorspringenden Felsencap zu, offenbar einem ehemaligen Vorgebirge, welches aber jetzt Dank der Anschwemmungen der Miliana einige hundert Schritte vom Strande abliegt und nur noch bei den schwersten Stürmen vom Salzwasser bespritzt wird. Es wird von einer tiefen Kluft durchschnitten, welche von Tunis aus deutlich sichtbar ist und bei den Mauren die Scharte Alis heisst, weil der Schwiegersohn des Propheten sie mit seinem Schwerte geschlagen haben soll, um seinem schwer bedrängten Heere einen Ausweg zu schaffen. Ein bequemer Weg führt zu ihr hinauf, sie hat offenbar früher bei Hochwasser als Durchgang gedient. Anfangs suchte ich an der Schattenseite, aber ohne Erfolg; der steile Abhang am Ausgang erlaubte das Herabsteigen nur auf einem grossen Umweg, und so entschloss ich mich zurückzukehren und auch die Sonnenseite genauer zu untersuchen. Gleich im Anfang fand ich ein paar lebende Stücke von *Helix Zaghuanensis,* dann aber auch eine reizende Clausilie, in welcher Böttger die verschollene *Clausilia*

Tristrami Pfr. erkannt hat, deren Heimath man seither weit unten im Süden vermuthete; sie fand sich in ziemlicher Anzahl besonders am Fuss der Felsen zwischen ihnen und der kurzen festanliegenden Rasendecke, ein Punkt, den man an Felswänden im Süden jederzeit sorgsam untersuchen muss. Herabsteigend folgte ich der von der Brandung zerrissenen Aussenseite des Kaps und fand hier noch den seltsamen kleinen Buliminus, den ich als *Buliminus Micelii* beschrieben habe, in den Unebenheiten so gut verborgen, dass er nur beim genausten Nachsuchen gefunden werden konnte. Bei meinem ersten Besuche drängte die Zeit zu sehr, als dass ich länger hätte herumsuchen dürfen, aber ein zweiter Besuch der Stelle ergab mir eine ziemliche Anzahl von Exemplaren, lieferte aber auch zugleich den Beweis, dass die Schnecke völlig auf diesen einzigen Fundort beschränkt ist. Da derselbe obendrein so ungünstig, wie möglich aussieht, ist es kein Wunder, dass selbst ein so ausgezeichneter Sammler wie Letourneux diese Art nicht aufgefunden hat.

(Fortsetzung folgt.)

Diagnosen neuer philippinischer Leptopomen.

Von

Dr. W. Kobelt.

1. *Leptopoma manhanense* n. sp.

Testa obtecte perforata, trochiformis, solidula sed haud crassa, subtranslucens, albida vel griseo-albida; spira exserta, exacte conica, apice acuto. Anfractus 6 vix convexiusculi striis obliquis fere costuliformibus distantibus sculpti, lineis spiralibus subtilissimis undulatis lirisque fortioribus distinctis granulato-decussati, ultimus acute angulatus et carina compressa acuta cingulatus, basi planatus, circa umbilicum tantum leviter gibboso-inflatus, antice haud descendens; sutura simplex,

impressa. Apertura obliqua, irregulariter ovata, parum excisa, intus albida; peristoma undique reflexum, marginibus approximatis, vix callo tenuissimo junctis, columellari sinuato in umbilicum impresso eumque fere omnino obtegente.

Diam. maj. 24, min. 19, alt. 23 mm.

Hab. Manhan insulae Luzon.

Differt a L. helicoide Grat. testa exacte trochiformi, umbilico fere clauso, sculptura et apertura late diversis.

2. *Leptopoma pyramis* n. sp.

Testa obtecte perforata, pyramidato-trochiformis, solidula sed haud crassa, translucens, alba; spira exserta, conica, apice acuto. Anfractus 6—7 vix convexiusculi, lente accrescentes, sutura distincta regulari discreti, subtilissime oblique striati et liris subundulatis spiralibus sub vitro fortiore tantum conspicuis granulati, liris nonnullis fortioribus distantibus regulariter dispositis. Anfractus ultimus acutissime angulatus et carina compressa cinctus, basi planatus, medio tantum leviter convexiusculus, circa umbilicum haud gibbus, antice minime descendens, sed ad aperturam supra leviter impressus. Apertura valde obliqua, ovato-triangularis, extus acuminata, alba; peristoma duplex: internum super parietem continuum, filiformi-incrassatum, externum supra protractum et ad insertionem leviter auriculatum, dein impressum; basale leviter reflexum, ad insertionem leviter dilatatum, perforationem fere omnino tegens.

Diam. maj. 19—21, min. 16—18, alt. 17—18 mm.

Hab. Malannami, leg. C. Semper.

Species persingularis, L. goniostomati forse comparanda, sed testa crassa, unicolore, sculptura diversa.

3. *Leptopoma distinguendum* (*Dohrn* mss.)

Testa angustissime et obtecte perforata, globuloso-conoidea, tenuis, pellucida, sericea, lutescenti albido-grisea, fascia brunnea angusta peripherica suturam in spirae anfractibus sequente ornata; spira exserta, apice acuto. Anfractus 5—6 convexi, regulariter crescentes, striis incrementi et spiralibus sub lente subtilissime granulati, ultimus teres, $^3/_5$ testae aequans, ad aperturam perparum descendens; sutura distincta. Apertura fere exacte circularis, vix excisa, fascia intus translucente; peristoma fere continuum, parum incrassatum, levissime reflexum, ad insertionem basalem haud dilatatum, intus callo filiformi remote labiatum.

Diam. maj. 12, min. 10, alt. 13 mm.

Hab. Palawan.

4. *Leptopoma dubium* n. sp.

Testa subobtecte perforata, globoso-conica, tenuis sed solida, spiraliter subtilissime lineata striisque incrementi tenuibus sculpta, carnea, lineis fuscis fulguratis ubique ornata; spira acuta, exserta. Anfractus 6 convexi, sutura distincta discreti, regulariter crescentes; ultimus inflatus, ad aperturam campanulatus, haud descendens. Apertura parum obliqua, rosacea; peristoma subcontinuum, ad modum campanulae dilatatum et protractum, sed vix reflexum, marginibus valde approximatis, callo distincto subcontinuis, columellari flexuoso, super perforationem leviter dilatato.

Diam. maj. 18, mm 14.5, alt. 18 mm.

Hab. Tabuntug.

5. *Leptopoma bipartitum* n. sp.

Testa perforata, depresse globoso-conica, tenuis sed solidula, pellucens, sub lente fortiore subtilissime spiraliter striata lineisque incrementi sculpta, alba, supra peripheriam anfractus ultimi tantum fasciis castaneis varie ornata; spira conica, apice acuto. Anfractus 5 convexi, regulariter crescentes, ultimus ad peripheriam obtuse angulatus, basi regulariter convexus, sutura distincta. Apertura obliqua, subcircularis alba, fasciis translucentibus, peristoma haud continuum, late reflexum, intus albolabiatum, marginibus approximatis, columellari exciso, cum basali angulum formante, perforationem haud obtegente.

Diam. maj. 14, min. 11, alt. 13 mm.

Hab. Mindanao.

6. *Leptopoma Amaliae* n. sp.

Testa subobtecte perforata, globoso-turbinata, solidula, subpellucida, striis spiralibus confertissimis undulatis lineisque incrementi irregularibus sculpta, carnea, lineis rufis fulguratis brevissimis strigatim dispositis ubique ornata, infra suturam anfractus ultimi fascia albida maculisque rufis obliquis signata; spira turbinata, apice acutiusculo, concolore. Anfractus 6 convexiusculi, ultimus angulatus, carina distincta albida et fascia supracarinali articulata angusta ornatus, basi regulariter rotundatus. Apertura obliqua, subcircularis; peristoma album, undique reflexum, interruptum, margine columellari exciso, angulum distinctum cum basali formante, perforationem semioccultante.

Diam. maj. 18, min. 14, alt. 17 mm.

Variat omnino alba, pellucens.

Hab. insulas Philippinarum.

7. *Leptopoma approximans* Dohrn mss.

Testa anguste perforata, subglobosa, tenuis, fragilis, spiraliter confertim striata vestigiisque incrementi regu-

laribus tenuibus subgranulata, liris spiralibus fortioribus subaequidistantibus, quarum peripherica anfractus ultimi distinctiore, cingulata; carneo-fuscescens, punctis rufis irregulariter sparsis ornata; spira depresse turbinata apice subtili. Anfractus 6 regulariter crescentes, convexiusculi, sutura impressa discreti; ultimus subinflatus, lira peripherica distinctiore carinatus, basi bene rotundatus. Apertura obliqua, dilatata, fere exacte circularis, carnea, peristomate carneo, undique breviter reflexo, subinterrupto marginibus approximatis callo tenui junctis, columellari regulariter arcuato, haud exciso. —

Diam. maj. 16, min. 13, alt. 15 mm.
Hab. Mindoro.

Die Mollusken der Umgebung von New-Philadelphia, O.

Von

Dr. V. Sterki.

(Schluss).

13. *U.* pustulosus ~~*psammatinus*~~ *Lea.* Junge Exemplare haben einen breiten grünen Strich vom Wirbel zum Unterrande, die Schalen sind schon in frühester Jugend ziemlich dick.
14. *U. triangularis Barnes.* Weibliche Exemplare viel selseltener als männliche. Ganz junge habe ich nicht gefunden.
15. *U. clavus Lam.* — Diese und die folgenden Arten spärlicher, so dass jedes halbwegs gute Stück mitgenommen wird.
16. *U. Iris Lea.*
17. *U. fabalis Lea.* Nur in leeren Exemplaren gefunden, meist einzelne verwitterte und abgerollte Schalen.

18. *U. multiradiatus Lea.* Offenbar nahe verwandt mit U. subovatus Lea. not so rare

19. *U. cylindricus Say.* Innenfläche sammt Schloss meist rauh, unansehnlich. Bei jungen — sehr niedlichen — Exemplaren Perlmutter glatt und rosenroth.

20. *U. tuberculatus Raf.* (verrucosus Barnes.) Die wenigen Exemplare sämmtlich leer und mehr oder weniger verwittert; bei keiner anderen Art bedauert man dies so sehr wie bei dieser!

21. *U. perplexus Lea.* Einige Weibchen in ziemlich gutem Zustande, von männlichen nur einzelne Schalen.

22. *U. compressus Lea* (auch Symphynota compressa Lea). Ein einzelnes junges, leeres Stück, vom River angeschwemmt.

23. *U. parvus Barnes.* Nur im Ohio-Canal einige Stück gefunden. Von besonderem Interesse dadurch, dass jederseits an der hinteren Mantelöffnung ein relativ grosses schwarzes Auge sitzt.

24. *Alasmodonta rugosa Barnes.* Eine der gemeinsten Arten überhaupt.

25. *Al. marginata Say.*

26. *Al. deltoidea Lea.* Beide häufig.

27. *Al. complanata Barnes.* Vom River nur etwa 8 leere, kleine Exemplare, aber nicht jung, und alle von ziemlich derselben Grösse. Grosse Stücke sind ziemlich häufig im Canal.

28. *Al. dehiscens.* Selten, und nur leer gesammelt.

29. *Al. Hildrethiana Lea.* Nur etwa 3 leere Exemplare, vom River ausgeworfen.

30. *Anodonta edentula Lea* (undulata Say). Sehr häufig; Gestalt ziemlich variirend; eine besondere kleinere Form zu unterscheiden.

31. *An. Ferussaciana Lea* (?). ~~Nur~~ im Riv und Canal, häufig.

32. *An. imbecillis Say.* Desgleichen: vom River (ausgeworfen), nur wenige Schalen.
33. *An. plana Lea.* Nicht häufig, ~~nur leere, meist zerbrochene Schalen~~ vom River angeschwemmt. — Wie früher bemerkt, in einem ausgetrockneten Sumpf eine grössere Zahl von leeren Schalen.

Gewiss ein ziemlich reiches Ergebniss, zu dem ich ohne die vermittelnde Ueberschwemmung wohl trotz aller Mühe kaum gekommen wäre.

Von ganz besonderem Interesse war das Geschlechtsverhältniss bei den Unionen, auf das mich Herr Professor Mousson noch speciell aufmerksam machte. Wenn man sich einmal daran gewöhnt hat, so kann man bei einem grossen Theil derselben die Geschlechter schon aussen an der Schale erkennen und in vielen Fällen auf den ersten Blick. Da die Brutbehälter des Weibchens, den äussern Kiemenblättern entsprechend, besonderen Platz in der Schale beanspruchen, so muss diese geräumiger sein. Bei den meisten Arten ist das am hinteren Ende der Fall, und oft kommen zur einfachen Erweiterung auch sonstige Eigenthümlichkeiten in der Gestaltung hinzu, um die weibliche Muschel zu einer besonderen und von der männlichen abweichenden zu machen. Von den hiesigen Arten zeigt sich das am auffallendsten bei U. perplexus Lea und triangularis Barnes, sowie auch bei verrucosus Raf.; sehr deutlich auch bei luteolus Lam. Geringer sind die Unterschiede, aber bei einiger Aufmerksamkeit unverkennbar, bei U. rectus Lam., subovatus Lea, multiradiatus Lea, plicatus Lesueur, ligamentinus Lam., iris Lea.

Die Brutbehälter selbst sind sehr verschieden gebaut. Von einfacher Form, gleich einer blossen Anschwellung, meist am freien Saume schwärzlich, fand ich sie bei U. ligamentinus, luteolus, subovatus, circulus, iris u. a. Bei U. phaseolus, Hildr. sehen sie aus wie ein gefälteltes Band, das aus lauter senkrechten Reihen von kleinen Stickperlen, die oberen dunkel, die am freien Rande roth, besteht, und gehen der ganzen Länge nach, darum hier auch die ganze Muschel beim Weibchen dicker ist. Ganz anders bei irroratus: hier bestehen sie aus 6—8 langen, fleischrothen, etwa 1 Linie dicken, fast wie Regenwürmer aussehenden, und neben einander liegend etwa 1 $^1/_2$ mal im Kreise umgebogenen Schläuchen, ziemlich die ganze innere Fläche der Muschelschalen einnehmend. Leider hatte ich keine Gelegenheit, ihre Gestaltung bei U. triangularis Barnes zu studiren, die offenbar einer besonderen Gruppe zugehört und ihre Verwandten wohl mehr im Süden hat.

Bei all der bedeutenden Reproductionskraft dieser Muscheln müssen die Bedingungen ihres Fortkommens im allgemeinen doch sehr günstige sein, wenn sie bei fast alljährlich wiederkehrenden Ueberschwemmungen und dem damit verbundenen Zugrundegehen von Tausenden alter und junger Individuen, immer wieder in Menge vorhanden sein können. — Was man hier über ihre Lebensart nach dem Verlassen des mütterlichen Brutsackes weiss, ist mir unbekannt.

Die Hochfluthen sind es nicht allein, welche sie fortwährend decimiren. Allen Gewässern entlang lebt die Moschusratte (Fiber zibethicus Cuv.), und sie nährt sich zu einem grossen Theile von Muscheln, die zu öffnen sie meisterlich versteht. Ich sah am Ohio-Canal stellenweise ganze Mengen namentlich von Unio flavus Raf. herumliegen und dabei die Fussspuren des Räubers. Wie er die Muscheln öffnet, ist schwer begreiflich, da die Schlossbänder meist intact sind, ebenso wie die Schalen. Die Beschreibung dieses Thieres in der Fauna von Ohio (Wirbelthiere) enthält die Notiz, dass man neben einem günstig gelegenen Stein oder Holzklotz oft ein Bushel und mehr solcher geleerter Schalen finde — »dem Conchologen eine willkommene Sammelgelegenheit.«

Ein hiesiger Herr theilte mir mit, er selber habe Haufen von 2—3 Bushels solch leerer Muschelschalen gesehen; am besten sind sie zu finden, wenn längere Zeit niedriger Wasserstand war. Er behauptet, dass auch der Racoon (Urocyon lotor L.) und die Otter in dieser Weise thätig seien. Nach Kennicott lässt die Moschusratte grosse, massive Schalen, wie die von Unio plicatus, oft uneröffnet liegen, oder nagt sie vom Rücken her an. — Gelegentlich sieht man Schalen mit kleinen runden Löchern (von ca. 2 mm Durchmesser); durch wessen Bemühung sie entstehen, ist mir unbekannt.

Kleinere Mittheilungen.

(Möve und Mollusken). Einem Berichte des Oberlehrers Dr. Egers in Norden, den unser Mitglied Dr. Lohmeyer in den landwirthschaftlichen Jahrbüchern mittheilt, entnehmen wir, dass im Magen der Möven neben ganz wenigen Fischresten und zahlreichen Krustaceen und Würmern, von Mollusken gefunden wurden *Cardium edule*, *Mytilus edulis*, *Litorina litorea*, *Mya truncata*, *Mactra stultorum*, *Tellina baltica* und *Pholas candida*. Im Magen von auf dem Festland geschossenen Möven fanden sich neben einigen Exemplaren von *Planorbis corneus* und *Limnaea auricularia* auch *Arion empiricorum* und besonders zahlreich *Agriolimax agrestis*.

Verschleppung von Schnecken mit Farbholz. Herr Dr. O. Schneider in Dresden übergab mir zwei schöne lebendfrische Gehäuse von *Bulimus (Orphnus) Larguillerti* Phil. mit dem Bemerken, dass sie aus amerikanischem Blauholz stammten und in demselben öfters importirt werden müssten, da er noch zwei junge zerbrochene und verwitterte Exemplare derselben Art zu gleicher Zeit erhalten habe. Da die genannte Schnecke zuerst aus der Provinz Sta. Catharina, Brasilien, beschrieben worden ist, dürfte das Farbholz — näheres ist mir darüber nicht mitgetheilt worden — wohl ebenfalls aus dieser oder einer Nachbarprovinz Brasiliens herstammen.

Dr. O. Boettger.

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Hoyle, William E., Preliminary Report on the Cephalopoda collected during the Cruise of H. M. S. „Challenger“. Part. I. *The Octopoda.* In Proc. Roy. Soc. Edinburgh vol. 13 p. 94—113. — Part. II. *The Dekapoda.* Ibid. p. 281—310.

Es wurden im Ganzen 31 Arten Octopoden erbeutet, darunter 19 (und zwei Genera) neu, Dekapoden 37, davon neu 19 (und drei Genera). Die meisten neuen Arten lieferten Octopus (11) und Sepia (10). Die neuen Arten sind in der folgenden Arbeit genauer beschrieben; im Holzschnitt werden abgebildet Japetella prismatica p. 107, Amphitretus pelagicus p. 113, Promachoteuthis megaptera p. 284, Bathyteuthis abyssicola p. 309.

Hoyle, William E., Diagnoses of new Species of Cephalopoda collected during the Cruise of H. M. S. „Challenger.“ Part. I. *The Octopoda.* — In Ann. Mag. N. H. March 1885 p. 222—236. — II. *The Dekapoda.* Ibid. Sept. p. 181—203.

Als neu beschrieben werden: I. ***Octopoda:*** Octopus verrucosus p. 122, Tristan da Cunha; — O. Boscii var. pallida p. 223, Bassstrasse; — O. australis p. 224, Port Jackson; — O. hongkongensis Steenstr. mss. p. 224, auf dem Hyalonemagrund südlich von Japan in 345 F.; — O. tonganus p. 225, Tongatabu; — O. vitiensis p. 226, Kandavu; — O. duplex p. 226, Twofold Bay, Australien; — O. bandensis p. 227, Banda; — O. marmoratus p. 227, Honolulu; — O. bermudensis p. 228, Bermudas; — O. levis p. 229, Heard, Island Südsee; — O. januarii Steenstr. mss., p. 229, vor Barra grande. — Eledone rotunda p. 230, Südsee, 1950—2225 F.; — E. brevis p. 230, südatlantischer Ocean, 600 F.; — Japetella n. gen. mit gelatinösem Körper, sehr weiter Mantelöffnung, kleiner Umbrella und einer Reihe Saugnäpfe auf den ungleichen Armen; J. prismatica p. 231, Brasilien; — J. diaphana p. 232, Papua. — Cirrhoteuthis magna p. 233, Prince Edwards Island, 1375 F.; — C. meangensis p. 234, Meangis Islands (nahe den Philippinen), 500 F.; — C. pacifica p. 235, Torresstrasse; — Amphitretus n. gen. mit doppelter Mantelöffnung; A. pelagicus p. 235, Kermandec Islands. — II. ***Dekapoda:*** Promachoteuthis n. gen. p. 181, mit grossen Schwanzfinnen, hinten freiem Mantel, langen Armen mit zwei Reihen Näpfen; Pr. megaptera p. 102 (Narr. Chall Exped. I. p. 273 fig. 109); — Loligo ellipsura p. 182, Sandy Point, Südamerika; — L. galatheae Steenstr. mss p. 183, Philippinen; — L. kobiensis p. 184, Japan; — L. edulis p. 186, Japan; — L. japonica Steenstr. p. 187, Japan; — Sepia esculenta p. 188, Japan; — S. elliptica p. 189, Neuguinea; — S Smithi p. 190, Neuguinea; — S. sulcata p. 192, Ki-Inseln; — S. andreanoides p. 193, Japan; — S. kiensis p. 194, Ki-Inseln; — S. kobiensis p. 195, Japan; — S. papuensis p. 197, Neuguinea; — S. cultrata Steenstrup mss. p. 198, Südostaustralien; — (Metasepia n. subg.) Pfefferi p. 199, Neuguinea; — Histiopsis n. g. Oegopsidarum, p. 201, von Calliteuthis Verr. durch die Zwischenmembran zwischen den dorsalen, dorsolateralen und lateralen Armen; — H. atlantica p. 201 (auch Narr. Chall. Exp. I p. 273), südatlantischer Ocean, 2025 F.

Hoyle, William E., on Loligopsis and some other Genera. In Proc. Roy. Phys. Soc. Edinburgh vol. VIII. p. 313—333.

Zählt 18 zu dieser Gattung gebrachte Arten auf, von denen nur L Peronii Lam. (und Schneehageni Pfeffer) wirklich dazu gerechnet werden können.

Hoyle, William E., Note on Loligo Forbesii Steenstrup, the so called L. vulgaris of our coast. Ibid. p. 459—462.

Der Autor erbringt den Nachweis, dass die an der englischen Küste gemeine Loligo-Art nicht zu L. vulgaris, sondern zu L. Steenstrupi gehört, und erörtert die Unterschiede der beiden Arten.

Herzenstein, S., Beiträge zur Kenntniss der Fauna der Murmanküste und des Weissen Meeres. I. Mollusca. — Sep.-Abz, aus ? p. 635—814.

Leider russisch geschrieben. Es werden 106 Arten aufgeführt, davon keine neu. Die Fauna gehört ihrem Gesammtcharakter nach zur gemässigten Abtheilung der arktischen Fauna und ist demgemäss reicher als die höherer Breiten; der grönländischen steht sie gegenwärtig an Artenzahl noch nach, doch kommen sehr viele Arten von der finmarkischen Küste auch hier vor und sind nur noch nicht aufgefunden worden. Nach Osten hin scheint die Artenzahl abzunehmen, was ganz natürlich wäre, da hier die sibirischen Ströme münden.

Holmberg, Dr. Ed. L., Viages al Tandil y a la Tinta. Molluscos, par el Dr. Ad. Doering. — In Actas Acad. Nac. Ciencias Cordoba V. 2.

Es werden nur sechs Arten genannt, davon neu Eudioptus Aguirrei und Patula Holmbergi.

Dybowski, Dr. W., Beschreibung einer neuen sibirischen Ancylus-Art. In Sitzungsber. Dorpater Naturf. Ges. 1885 p. 512.

Ancylus Kobeltii n. aus der Angara

Dybowski, Dr. W., Studien über die Zahnplatten des Planorbis marginatus Drp. — Ibid. p. 315.

Die mittleren und äusseren Seitenplatten weichen von denen von Plan. corneus und dem Limnäentypus überhaupt erheblich ab und ähneln mehr denen von Choanomphalus.

Martens, Ed. von, einige neu erworbene Conchylien aus dem zoolog. Museum. — In Sitzungsber. Ges. naturf. Fr. 1885 p. 190.

1. Landschnecken aus Minaes Geraes, 5 sp., neu Bul. nasutus. — 2. Von Amasia 5 sp., keine neu. — 3. Aus der Minahassa; neu Hel. pilisparsa = gabata Wallace nec Gould. — 4. Giftige Miesmuscheln aus Wilhelmshafen.

Semper, Dr. C., Reisen im Archipel der Philippinen. II. 3. Heft 7.

Enthält die *Vaginulidae.* Als neu beschrieben werden V. coerulescens, Caracas t, 26 f. 9. 10; — Strebelii n. (im Texte mexicanus, nec Streb.) Mexiko, t. 26 fig. 7; — decipiens Chile, t. 25 fig. 3; — dubia St. Thomas t. 26 fig. 12; — Bielenbergi Puerto Cabello, t. 24 fig. 9; t. 26. fig. 6; var. t. 24 fig. 3; — punctatissima Westindien, t. 24 fig. 4; — immaculata Caracas t. 26 fig. 11. 13. — Kreidelii unbekannten Fundortes, t. 26 fig. 14. 19; — portoricensis Portorico, t. 24 fig. 6, t. 26 fig. 20; — Boettgeri, Brasilien, t. 27 fig. 1. 2; — variegata Brasilien, t. 26 fig. 17. t. 27 fig. 34, 35; — linguaeformis, Guayaquil, t. 25 fig. 4, t. 27 fig. 3; — multicolor, Buenos Aires, t. 24 fig. 12, t. 27 fig. 4. 5; — telescopium, ? Südamerika, t. 27 fig. 6. 7; — Behnii, Rio Janeiro, t. 27 fig. 9. 10, t. 25 fig. 9; — lamellata, Rio Janeiro,

t. 27 fig. 8; — marginata ibid., t. 27 fig. 11; — Kjellerupii, Bahia, t. 27 fig. 15; — Kroyeri, La Plata, t. 26 fig. 11, t. 27 fig. 16; — Martensii, Rio Janeiro, . 27 fig. 18; — Koellikeri, Ostafrika, t. 27 fig. 23. 25; — Mörchii, Guadeloupe, t. 25 fig. 13, t. 27 fig. 20; — trilineata, Mauritius, t. 25 fig. 8, t. 27 fig. 29; — Andreana, Mauritius, t. 27 fig. 22, t. 25 fig. 10; — Idae, Borneo, t. 27 fig. 27; — Reinhardti, Macao, t. 27 fig. 19, t. 25 fig. 14; — Zamboangensis, Zamboanga, t. 27 fig. 33; — Frauenfeldi, Madras, t. 27 fig. 32; — Voigtii n. unbekannten Fundortes, t. 27 fig. 24, t. 25 fig. 6.

Krause, Dr. Arthur, ein Beitrag zur Kenntniss der Mollusken-Fauna des Beringsmeeres. I. *Brachiopoda et Lamellibranchiata.* In Archiv f. Naturgesch. vol. 51 p. 14—40 t. 3. — II. *Gastropoda et Pteropoda.* Ibid. p. 856—302 t. 16—18.

Der Verfasser hat namentlich auf einer Bootreise längs der Südküste der Tschuktschen-Halbinsel gesammelt, leider bei theilweise sehr ungünstigem Wetter. Zur Behandlung kommen Brachiopoda 1 (Rhynchonella psittacea), Lamellibranchiata 40 (neu Leda pernula var. radiata p. 23 t. 3 f. 2; — Portlandia Dalli p. 27 t. 3 f. 1; — Cardita borealis var. crebricostata und var. paucicostata p. 30 t. 3 f. 4. 5; — Tellimya planata Dall mss., p. 34 t. 3 f. 6; — Anatina ? aleutica p. 38 t. 3 f. 7); — Gastropoda 66 (neu Margarita Frielei p. 263 t. 16 f. 2; — Cingula robusta Dall mss. p. 270 t. 17 f. 1; — Bela metschigmensis p. 276 t. 18 f. 2. 10; — B. Albrechti p. 276 t. 18 f. 3. 11; — B. violacea var. nodulosa p. 277 t. 18 f. 4. 12; — B. Lütkeana p. 281 t. 18 f. 16; — Sipho Martensi p. 87 t. 18 f. 18; — Adalaria tschuktschika p. 296 t. 17 f. 5); — Pteropoda 3 (neu Clione Dalli p. 298 t. 18 f. 19a). — Von den meisten Gastropoden sind auch die Zungenzähne abgebildet, wodurch das Werkchen zu einem sehr werthvollen Beitrag zur Kenntniss der nordischen Mollusken wird.

Martini-Chemnitz, Conchylien-Cabinet. Neue Ausgabe.

Lfg. 334. Limnaeidae, von Clessin. Neu Planorbis strictus p. 223 t. 33 fig. 4: ? Centralamerika; — Pl. paucispiratus p. 223 t. 33 f. 8, solidulus p. 223 t. 33 fig. 10, unbekannten Fundortes; — Pl. Hindu p. 224 t. 33 fig. 9, Indien.

Lfg. 335. Cancellaria, von Löbbecke. Keine n. sp.

Lfg. 336. Limnaeidae, von Clessin. Neu Physa Hjalmarsoni p. 293 t. 42 fig. 6, Honduras; — Ph. Stolli p 293 t. 42 fig. 11, Guatemala; — Ph. Smithi p. 290 t. 42 fig. 2. 3, Murray River.

Lfg. 237. Helix, von Dr. Dohrn Keine n. sp.

Journal de Conchyliologie. 1885. No. 4.

p. 253. *Vayssière, A.*, Etude sur l'organisation de la Truncatella truncatula Drp. — Gibt die genaue Anatomie und weist nach, dass die Gattung Kiemen trägt, also nicht bei den Pneumonopomen bleiben kann. Im Anschluss wird ein interessantes bei ihr schmarotzendes Infusorium, Scyphidia Fischeri, beschrieben.

p. 228. *Morelet, A.*, Malacologie des Comores (4me art.). Récolte de M. Humblot à la Grande Comore. Die schwer zugängliche, sich bis 2800 m. erhebende Insel war seither so gut wie unbekannt; ihre Fauna schliesst sich indess eng an die der anderen Komoren an Als neu beschrieben werden: Achatina (Homorus) monacha p. 290 t. 14 fig. 7; — Stenogyra terebella p. 290 f. 1; — canonica p. 291 fig. 8; — Opeas longula p. 292 fig 9; — O. apiculum p. 292 fig. 10; — Gibbulina Comorensis p. 293 fig. 3; — Ennea Humbloti p. 294 fig. 2; — E. ovularis p. 295 fig. 6; — E corneola p. 295 fig. 11; — E. vitrea p. 296 fig. 12; — E. plicigera p. 295 fig. 5; — Otopoma Humbloti p. 298 fig. 4; — Ot. polyzonatum p. 399 fig. 15; — Ot. anaglyptum p. 300 fig. 14.

p. 302. *Fischer, P.*, Contribution à la faune malacologique du Puy-de-Dôme. II. Mollusques des environs de Châtel-Guyon. — 57 sp., keine neu.

p. 310. *Crosse, H.*. Diagnoses Molluscorum novorum in regione Usagara dicta, Africae orientalis, collectorum. Neu Ennea Usagarae p. 310; — E. galactochila p. 311; — E. ringens p. 311.

p. 312. *Morlet, L.*, Diagnoses Conchyliorum fossilium novorum, in stratis eocenicis repertorum. — Neu Lima Barreti p. 312, Crènes; — Rissoina Barreti p. 312, le Ruel; — R. Cloezi p. 313, Crènes; — Rissoa Barreti p. 313, ibid.; — Melania (Bayania) Raincourti p. 314, ibid.; — Odostomia Barreti p. 314, ibid.; — Bulla Bezanconi p. 314, ibid.; — Solarium Langlassei p. 318, ibid.; — Bifrontia Crenensis p. 315, ibid; — Conus Crenensis p. 315, ibid;

Ancey, C. F., Coquilles marines des Cotes d'Abessinie et de Zanzibar, recueïllies par M. Raffray en 1873 et en 1874. — In le Naturaliste p. 220—222.

32 Arten, neu Pecten Raffrayi p. 221.

The Journal of Conchology. Vol. V. No. 1.

p. 1. *Sowerby G. B.*, Marine Shells of South Africa, collected at Port Elizabeth, with descriptions of some new Species. Neu: Cypraea puncturata p. 2; — Euthria fuscotincta p. 2; — Cominella unifasciata p. 3; — Cominella angnsta p. 4; — Pleurotoma rousi p. 6; — Pl. bairstowi p. 6; — Latirus bairstowi p. 8; — L. rousi p. 8; — Marginella lineolata p. 9; — M. bairstowi p. 9.

p. 13. *Cockerell, Sydney C.*, Land- and Freshwater Shells in the Normandy. — 57 Arten, davon 11 in der von der Soc. Linn. Nord du France herausgegebenen Liste nicht aufgeführt.

p. 17. *Jeffrey, William*, Nature and Development of the Hairs or Bristles on some Land- and Freshwater Shells.

p. 26. *Cockerell, T. D. A.*, Notes on the Parmacella of Gibraltar.

p. 28. *Tomlin, J. R. Brockton*, Additions to the list of Land and Freshwater Mollusca of Llanduno.

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NEW AND LITTLE-KNOWN SPECIES OF SOUTH AMERICAN FRESH WATER MUSSELS OF THE GENUS DIPLODON

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BY

WILLIAM B. MARSHALL

Assistant Curator, Division of Marine Invertebrates, United States National Museum

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No. 2209.—From the Proceedings of the United States National Museum,
Vol. 53, pages 381–388, with Plates 50–55

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By William B. Marshall,

Assistant Curator, Division of Marine Invertebrates, United States National Museum.

The new *Diplodon* herein described under the name *felipponei* was received in 1915 from Dr. Florentino Felippone, of Montevideo, Uruguay. The one described under the name *fortis* was received from the same donor about three years ago and has been in the collection of the United States National Museum under the name of *D. delodontus*.

Illustrations are given of six other species of *Diplodon* described by Mr. C. T. Simpson from material in the collection of the United States National Museum. Hitherto these species have not been figured.

DIPLODON FELIPPONEI, new species.

Plate 50, figs. 1–3; plate 51, fig. 1.

Shell thick, heavy and moderately swollen, elliptic in outline, valves greatly thickened in front. Gaping slightly front and back. Surface nearly evenly rounded and lacking a clearly defined posterior ridge. Anterior and posterior portions rounding up gently into the middle portion of the shell. Middle of the posterior area with a low, rounded, radial rib, other parts of shell obscurely radiately striated. On the middle portion the striae become more pronounced and partake of the nature of obsolete ribs. Rest periods about seven, indicated by a concentric elevating of the surface above the succeeding growth. Color light yellowish chestnut at the beaks, deepening regularly toward the margins, where it becomes dark chestnut. Periostracum shining, paper-like, tending to peel and curl at the posterior margin. Nacre silvery white, slightly iridescent at the posterior end, obsoletely thimble-pitted or granular. Anterior adductor scar deep, especially at its upper part, posterior adductor scar nearly superficial. Other muscle scars deeply punched. Pseudocardinal teeth large and heavy and much split up. Right valve with a large lateral tooth which is granular on both its surfaces. Left valve with two lateral teeth which are granular on their inner faces. Sinulus long, narrow, slightly bowed and ending in a sharp point.

Proceedings U. S. National Museum, Vol. 53—2209.

The type, Cat. No. 322291, U.S.N.M., comes from Maldonado, Uruguay. It measures—length, 83 mm.; height, 59 mm.; diameter, 38 mm. It was donated to the United States Mational Museum by Dr. F. Felippone, of Montevideo, Uruguay, in whose honor I take pleasure in naming the species.

In richness and warmth of coloring, regularity of form and outline and in its appearance of exuberant health and prosperity this is one of the handsomest of the *Diplodons*. Externally it mimics some of the forms of *Anodontites wymani* and might pass for that shell if mixed in with a series of that species.

Its relationships point in two directions—namely, toward *D. rudus* Lea and *D. paranensis* Lea. Both of these species show the obsolete radiating ribs noted in the description of *felipponei*. From *D. rudus* it differs in outline, in not having a compressed posterior area and in being nearly straight instead of sinuate along the hinge line, and especially in the character of the pseudocardinals which, in *D. rudus*, are long and thin and placed parallel to the hinge line. From *D. paranensis* it can be distinguished at once by the elliptic outline, lack of the inflated ventral margin and by the character of pseudocardinals.

Another specimen of this same species is Cat. No. 180782, which measures—length, 77 mm.; height, 54 mm.; diameter, 31 mm. It comes from Arroyo Sarandi Grande, Uruguay, and was received from Mr. S. Olea. It is an exact duplicate of the type in every detail except size and state of preservation. The ratios of its length to height and to diameter are almost exactly the same as those of the type. This specimen has been in the collection since 1904 without specific name.

Since the above was written I have identified for Doctor Felippone five specimens of this species. One of these (his No. 593) from Arroyo Maciel, Florida, Uruguay, is, in some respects, superior to the type, especially in size. It measures—length, 94 mm.; height, 68 mm.; diameter, 40 mm. His numbers 606, 609, 610, and 611 each include a single valve in a poor state of preservation. They come from Rio Yi, Durazno, Uruguay.

DIPLODON FORTIS, new species.

Plate 52, figs. 1–4.

Shell thick, heavy, and much swollen. Outline elongately subquadrate, regularly rounded in front, prolonged into a blunt point behind, resembling in general form many specimens of *Unio tetralasmus* Say. Posterior dorsal ridge full, high, and rounded. A faint rib traverses the posterior area from the beak to a point just above the posterior angle. Ventral and dorsal margins nearly parallel. Surface with indistinct concentric fine lines, the rest periods indicated by dark lines. Anterior and middle portion with obscure radial sculpture. Color chestnut brown, darker posteriorly. Beaks eroded.

Nacre silvery white, tending to bluish white and iridescence posteriorly. Right valve with one small and one large pseudocardinal tooth, the latter grooved lengthwise; and a winglike lateral tooth. Left valve with a large anterior pseudocardinal, a deeply sunken linear mid-tooth, and a small posterior tooth. Lateral teeth of left valve two, very strong. Anterior muscle scars deeply impressed, posterior scars superficial. Anterior portion of shell much thickened, especially between the pallial line and the ventral margin. Shell gaping slightly front and back, enough to insert a slip of thick paper. Sinulus long, narrow, and pointed.

The type, Cat. No. 270899, U.S.N.M., measures—length, 66 mm.; height, 37 mm.; diameter, 27 mm. It comes from Rio Negro, Tacuarembo, Uruguay. It was presented to the museum several years ago by Dr. Florentino Felippone, and has been here under the name *delodontus* Lamarck. This species is related to *Diplodon charruanus* Orbigny, but is more nasute, having the ventral margin nearly straight and more nearly parallel to the dorsal margin. The pseudocardinal teeth of *charruanus* are largely divided into sharp points with corresponding sockets in the opposing teeth. Compared with these the teeth of *fortis* are much more simple. Authentic specimens of *charruanus*, from Orbigny show that its beaks are heavily sculptured and that this sculpture covers a considerable area. The beaks of *fortis* are eroded but the area eroded is less than the area sculptured in *charruanus*, and yet there is no indication of sculpture. From this it may be inferred that the sculptured area in *fortis* would be less than that in *charruanus*. Although of but moderate size, its compact, chunky form, its weight, and the thickening of the shelly matter, conveys an idea of strength and this has suggested the specific name *fortis*.

THE TYPES OF SIX LITTLE-KNOWN SPECIES OF SOUTH AMERICAN DIPLODON.

The following six species were described by Mr. Charles T. Simpson in A Descriptive Catalogue of the Naiades, or Pearly Fresh-water Mussels, published in 1914. His descriptions were based upon material in the collection of the United States National Museum, but no figures were given. The following descriptions and illustrations of the types will help more clearly to define the various species:

DIPLODON MIMUS Simpson.

Plate 51, figs. 3–6.

Diplodon mimus SIMPSON, A Descriptive Catalogue of the Naiades or Pearly Fresh-water Mussels, 1914, p. 1249.

Shell small, solid, obliquely rhomboid, somewhat inflated along the posterior ridge, which is low, rounded, and widely biangulate.

Dorsal and ventral margins nearly parallel. Growth lines numerous, fine. Rest periods not sharply defined. Periostracum thin, closely adhering, slightly ruffled along the ventral margin, light chestnut in color, somewhat tawney in the center of the disk. Beaks much eroded. Pseudocardinals two in the right valve, the upper very small, the lower thick, high, and much crenulated. Pseudocardinals of left valve two, widely separated, the rear one small, the front one larger and much crenulated. Lateral tooth of right valve high, granulous. Lateral teeth of left valve subequal, crenulated. Nacre lurid, purplish-white, thickened in front.

The type (pl. 51, figs. 3–6) is one of two specimens of United States National Museum, Cat. No. 162425. It measures—length, 45 mm.; height, 27 mm.; diameter, 15 mm.; and comes from Iguape, Brazil, from Dr. H. von Ihering.

"A small, solid, rhomboid species which almost exactly mimics in external appearance some of the varieties of *Unio complanatus*."—Simpson.

DIPLODON PERPLEXUS Simpson.

Plate 52, fig. 5; plate 53, figs. 1–4.

Diplodon perplexus Simpson, A Descriptive Catalogue of the Naiades or Pearly Fresh-water Mussels, 1914, p. 1248.

Shell moderately thin, subrhomboidal, regularly rounded in front, obtusely pointed behind; posterior margin oblique. Ventral and dorsal margins subparallel. Posterior ridge low, rounded. Beaks but little elevated, located one-quarter of the length of the shell from the anterior margin. Surface of the shell with many fine growth lines. Rest periods feebly marked, except the last which is indicated by a dark line and a shallow groove. Periostracum thin, shining, closely adhering, olivaceous, darkening to chestnut anteriorly and posteriorly, slightly ruffled on the posterior dorsal area. Anterior half of shell with numerous, well-marked radiating striae. Nacre milky white and thickened anteriorly, moderately iridescent and thin posteriorly. Pseudocardinals of right valve unequal, the upper one small, the lower one three times as high, crenulated, set at an angle of about fifty degrees with the lateral. Pseudocardinal of right valve obliquely flattened and somewhat excavated, its upper margin sharply crenulated. Lateral tooth of right valve thin, high, slightly arcuate, its margin crenulated. Laterals of left valve two, the upper one low, the lower one high, the groove between them deep and narrow.

The type (pl. 53, figs. 1–4) is one of four specimens in the United States National Museum (Cat. No. 150389), and measures—length, 77 m.; height, 43 mm.; diameter, 26 mm. It comes from Lake Portrero, near Maldonado, Uruguay, and was collected and presented by Dr. William Rush, U. S. N. Four other specimens and one odd valve (Cat. No. 150390 U.S.N.M.) were sent by Doctor Rush from the same place.

A lot of South American naiades just identified for Doctor Felippone includes 27 specimens of this species, of various ages, from localities in Uruguay. The two largest and oldest specimens measure, respectively—length, 91 mm.; height, 47 mm.; diameter, 27 mm.; and length, 86 mm.; height, 46 mm.; diameter, 29 mm. The old specimens retain all the typical characters, and vary from the younger specimens only in the thickening and enlarging of the pseudocardinal teeth. As is well known, a similar thicking and enlarging of these teeth is a common, almost a usual, occurrence in old specimens of the naiades in general.

DIPLODON SUPPOSITUS Simpson.

Plate 51, fig. 2; plate 54, figs. 1–4.

Diplodon suppositus SIMPSON, A Descriptive Catalogue of the Naiades or Pearly Fresh-water Mussels, 1914, p. 1245.

Diplodon piceus (part) SIMPSON, Synopsis, 1900, p. 877.

Shell moderately thin to subsolid, thinner posteriorly, slightly thickened anteriorly. Outline subrhomboidal, regularly rounded in front, bluntly round-pointed behind. Dorsal and ventral margins nearly parallel, the ventral margin slightly arcuate. Posterior dorsal ridge nearly wanting and, hence, the posterior dorsal area not distinctly marked off from the general surface of the shell. Beaks low, eroded in the type. Surface of shell with many poorly marked growth lines, obscurely showing four rest periods. Anterior portion with faint radial striae. Epidermis chestnut, bronzy. Nacre bluish white or livid, nearly dull anteriorly, brilliant posteriorly. Radiating striae show through the nacre at the posterior third. Pseudocardinals of right valve two, thin, parallel, set at an angle of about sixty degrees with the lateral. In the left valve the pseudocardinals are not sharply defined into two. Lateral teeth two in the left valve, one in the right valve.

The type (pl. 54, figs. 1–4) measures—length, 49 mm.; height, 26 mm.; diameter, 14 mm. It came from Parana, Brazil, and is one of four specimens bearing Cat. No. 162374, U.S.N.M.

Plate 51, fig. 2, represents the beak of this species, enlarged three diameters. The specimen figured comes from Rio Tiete, Brazil, and is one of three specimens in the United States National Museum (Cat. No. 128824). Both the specimens figured were received from Dr. H. von Ihering.

In addition to the specimens mentioned above the collection contains twelve other lots including 26 specimens, all from localities in Southern Brazil. All these were identified by Simpson as belonging to *D. suppositus*.

DIPLODON TRIVIALIS Simpson.

Plate 54, figs. 5–8.

Diplodon trivialis SIMPSON, A Descriptive Catalogue of the Naiades or Pearly Fresh-water Mussels, 1914, p. 1250.

Shell obovate, moderately inflated, subsolid, evenly rounded before and behind, narrower in front. Dorsal and ventral margins curving. Posterior ridge rounded, scarcely developed. Beaks moderately elevated, somewhat eroded, but showing that the sculpture consisted of about 20 radiating bars. Surface with a number of feebly marked growth lines, with four rest periods, indicated by dark lines. Faint indications of radiating striae on nearly the whole surface. Periostracum scarcely shining, clothlike, very dark olivaceous chestnut, closely adhering. Nacre bluish-white, somewhat iridescent, thickened along part of the ventral margin. Pseudocardinals of right valve parallel to each other, the upper one low, small and linear. The lower one thick, triangular, set at an angle of about 50 degrees with the lateral. Pseudocardinals of left valve distinctly two, subequal, set at an angle with each other. Lateral of right valve thin and high. Laterals of left valve subequal, the groove between them rather deep and wide.

The type (pl. 54, figs. 5–8), Cat. No. 162409, U.S.N.M., measures—length, 51 mm.; height, 33 mm.; diameter, 19 mm. It comes from Taboticabal, São Paulo, Brazil, and was received from Dr. H. von Ihering. Cat. No. 162406 includes two specimens and Cat. No. 162411 includes one specimen, all from the same source as the type. Cat. Nos. 125739, 162407, and 162408 each include one specimen from Piracicaba, São Paulo, Brazil, from Dr. von Ihering. Cat. No. 125703 includes one specimen from Rio Grande do Sul, São Paulo, Brazil. from Mr. B. H. Wright.

Mr. Simpson at first identified all of the above as *Diplodon peculiaris* Lea, but later came to the conclusion that they belonged to a new species. The collection contains the type of *peculiaris*, with which I have compared the type of *trivialis*, and I believe the two are distinct. Figure 6 shows the sculpture of the beaks. The rays are finer, more numerous, occupy a smaller area, and are more nearly parallel than those of *peculiaris*.

Two of the eight specimens in the collection have two lateral teeth in each valve. The other six specimens have a single lateral in the right valve and two laterals in the left valve.

DIPLODON SANTA MARIAE Simpson.

Plate 52, fig. 6; plate 55, figs. 1–4.

Diplodon santa mariae SIMPSON, A Descriptive Catalogue of the Naiades or Pearly Fresh-water Mussels, 1914, p. 1270.

Shell oblong, rhomboid, nearly twice as long as wide, moderately thin. Ventral and dorsal margins nearly parallel. Posterior ridge low, rounded, biangulate. Posterior margin biangulate. Beaks low, much eroded. Surface with many fine lines of growth and with four rest periods indicated by dark lines. Numerous well-marked striae radiate from the beaks to the ventral margin. Periostracum dark brown, somewhat bronzy, scarcely shining, darker at the posterior end. Nacre livid in the upper portion, white below, brilliant posteriorly, thickened anteriorly, iridescently radiately striate. Pseudocardinals of right valve long, low, the upper the smaller, the groove between them slightly curved. Pseudocardinal of the left valve plate like, standing on a narrow shelf, thin at its upper end, thickened at the lower end. Lateral tooth of right valve long, low, and granulous. Laterals of the left valve nearly equal, the groove between them widening at the rear.

The type (pl. 55, figs. 1–4) is one of three specimens of Cat. No. 162383, U.S.N.M., from Rio Itapoca, Brazil, received from Dr. H. von Ihering. It measures—length, 63 mm., height, 33 mm., diameter 18 mm. Plate 52, figure 6, shows the beak (enlarged three diameters) of a specimen from the same locality and with the same catalogue number.

DIPLODON SEMIGRANOSUS Simpson.

Plate 55, figs. 5–8.

Diplodon semigranosus Simpson, A Descriptive Catalogue of the Naiades or Pearly Fresh-water Mussels, 1914, p. 1252.

Shell rather small, irregularly long elliptical, sharply rounded in front, somewhat nasute behind. Ventral margin regularly curved. Posterior ridge rounded, scarcely developed. Beaks apparently low, eroded, retaining vestiges of radial, somewhat granular, sculpture. Surface with feeble growth lines and three or four rest periods indicated by dark lines. Numerous faint, slightly granular striae radiate from the beaks, giving the surface a semigranulous appearance, especially anteriorly.

Periostracum thin, closely adhering, olivaceous, tinged with greenish, somewhat glossy. Nacre dirty bluish-white, thickened along the forward portion of the ventral margin, thin and iridescent posteriorly. Pseudocardinals of right valve moderately thick, parallel, the groove between them wide and deep. Pseudocardinal of left valve thin and plate-like. Lateral tooth of right valve moderately high. The upper lateral of the left valve low and weak, the lower one higher and moderately strong.

The type (pl. 55, figs. 5–8) is one of 11 specimens of Cat. No. 128790, U.S.N.M., from Rio Tiete, São Paulo, Brazil, from Dr. H. von Ihering. It measures—length, 47 mm.; height, 26 mm.; diameter, 15 mm.

Cat. No. 162414 includes two and No. 162415 one specimen from Ponte Grande, São Paulo, No. 162413 one specimen from Os Perus, São Paulo; No. 162412 six specimens from Ponta Grossa, Parana. All these localities are in southern Brazil and all the specimens were received from Dr. von Ihering.

EXPLANATION OF PLATES.

PLATE 50.

FIGS. 1–3. *Diplodon felipponei* Marshall. Natural size.

PLATE 51.

FIG. 1. *Diplodon felipponei* Marshall. Natural size.
2. *Diplodon suppositus* Simpson. Beak × 3.
3–6. *Diplodon mimus* Simpson. Natural size.

PLATE 52.

FIGS. 1–4. *Diplodon fortis* Marshall. Natural size.
5. *Diplodon perplexus* Simpson. Beak × 3.
6. *Diplodon santa mariae* Simpson. Beak × 3.

PLATE 53.

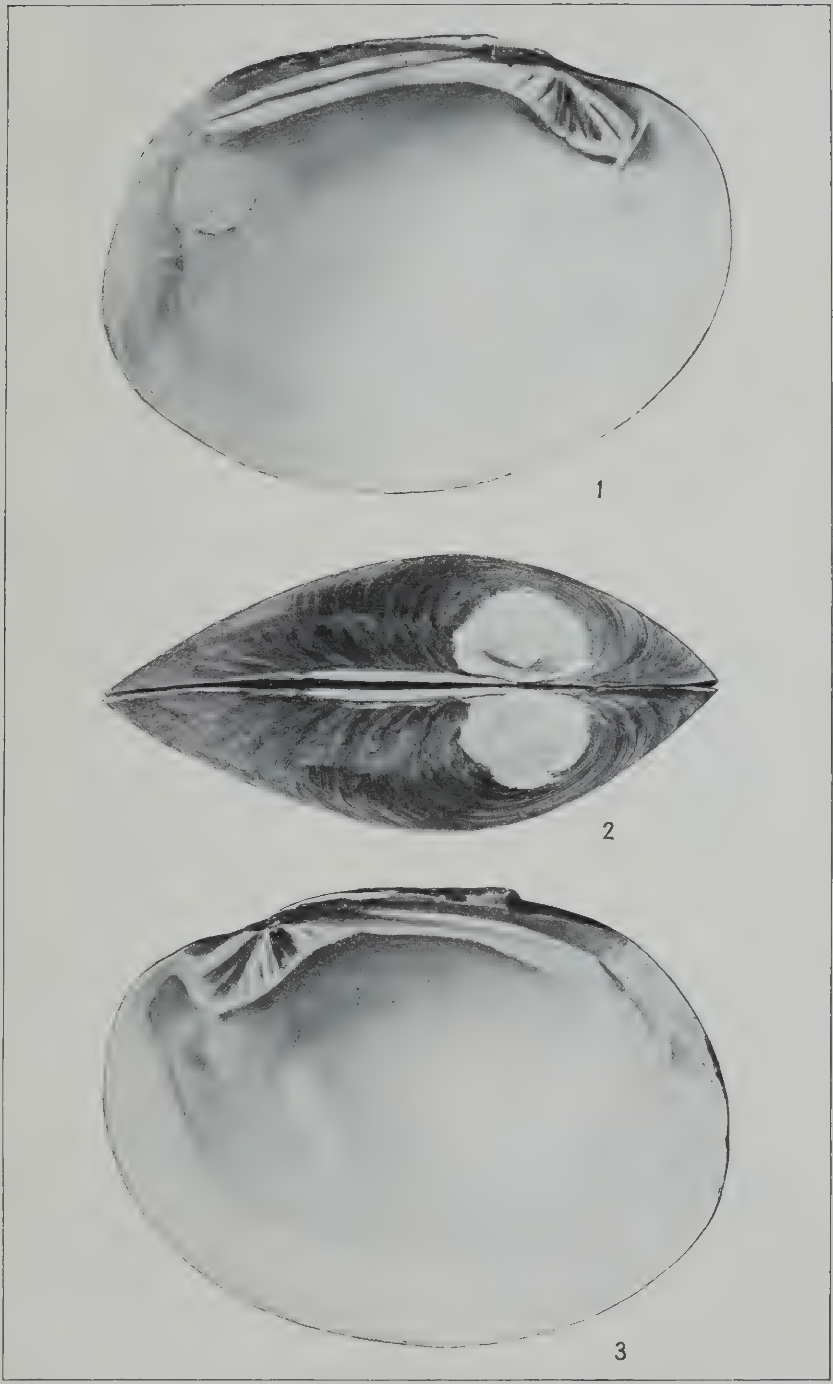
FIGS. 1–4. *Diplodon perplexus* Simpson. Natural size.

PLATE 54.

FIGS. 1–4. *Diplodon suppositus* Simpson. Natural size.
5–8. *Diplodon trivialis* Simpson. Natural size.

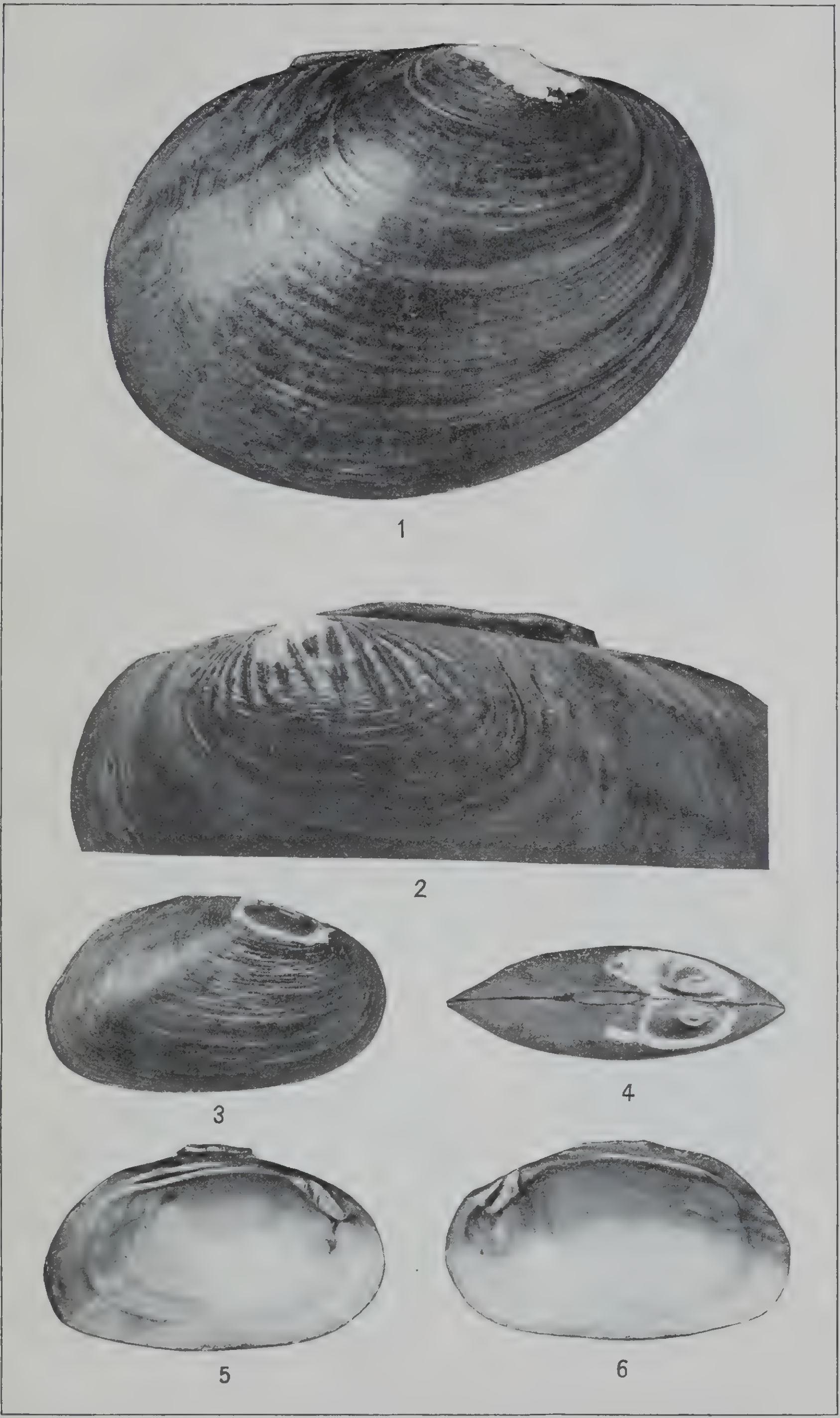
PLATE 55.

FIGS. 1–4. *Diplodon santa mariae* Simpson. Natural size.
5–8. *Diplodon semigranosus* Simpson. Natural size.



South American Diplodons.

For explanation of plate see page 388.



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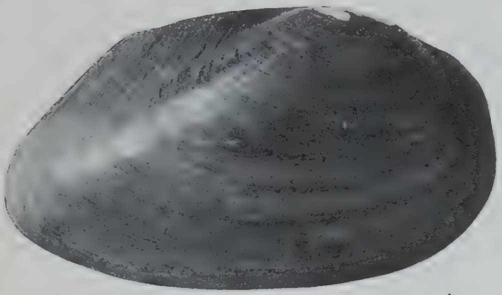

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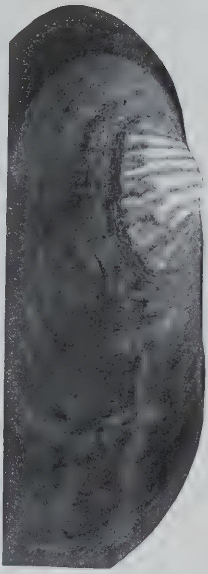

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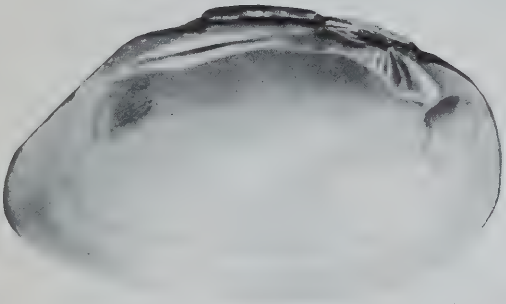

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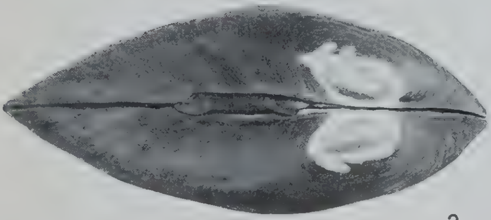

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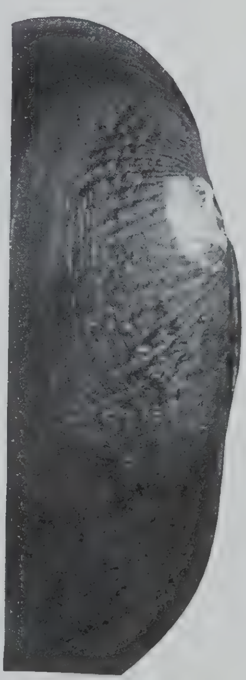

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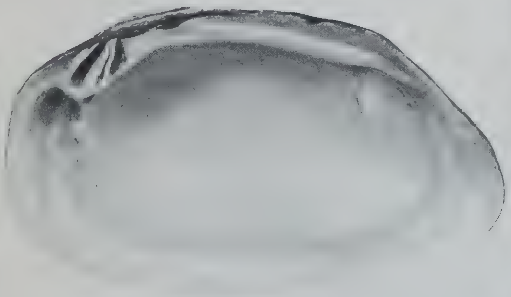

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South American Diplodons.

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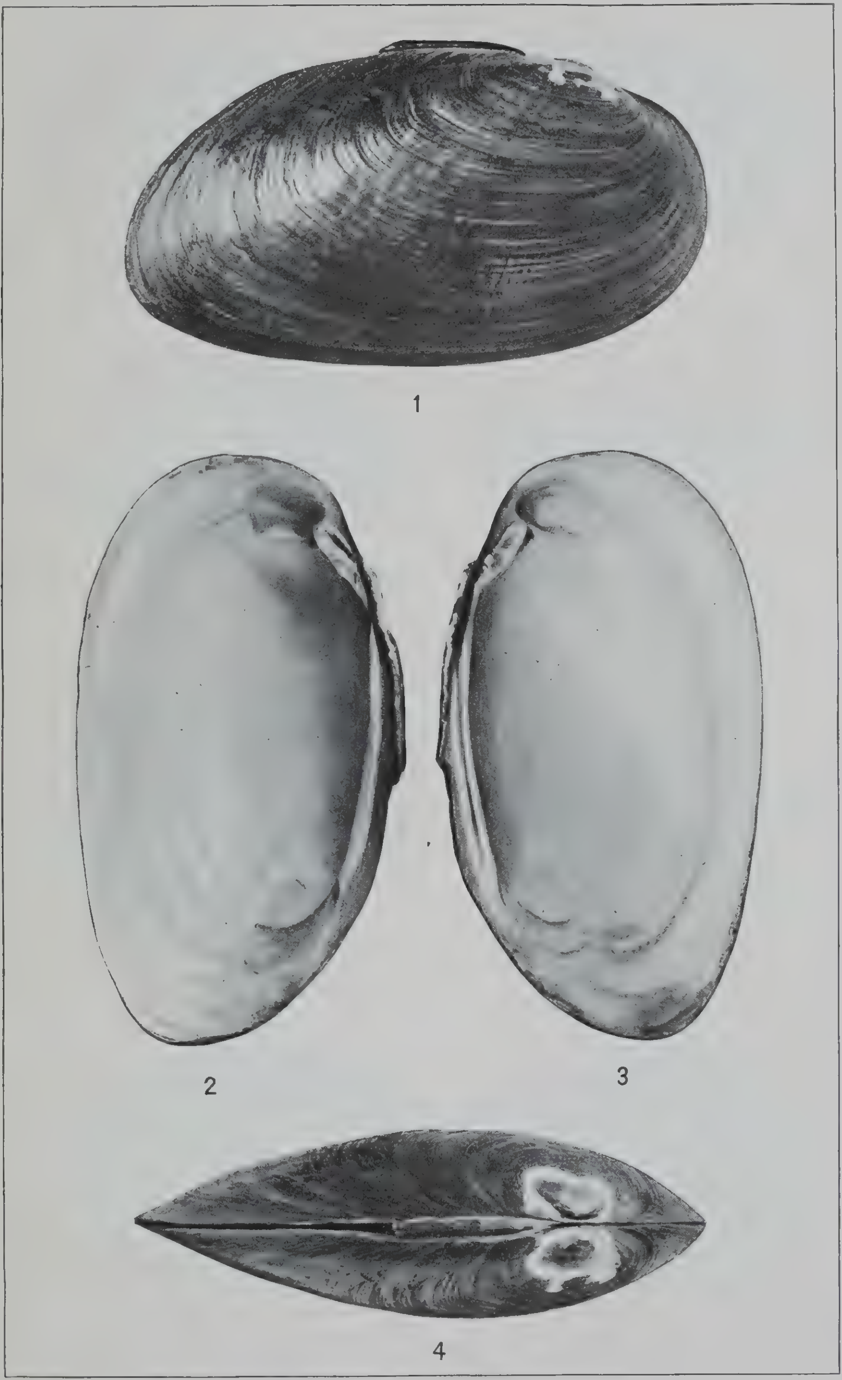
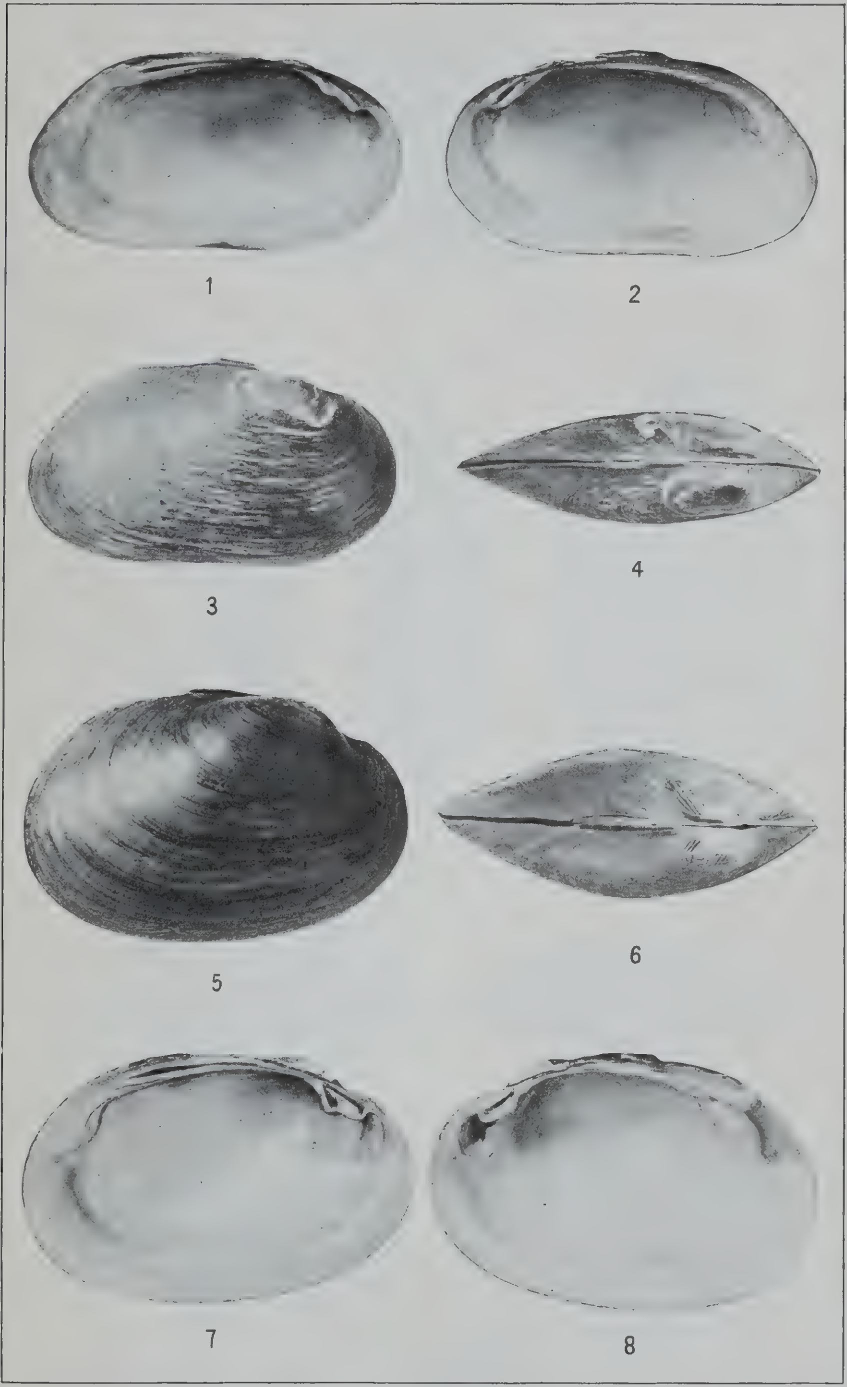


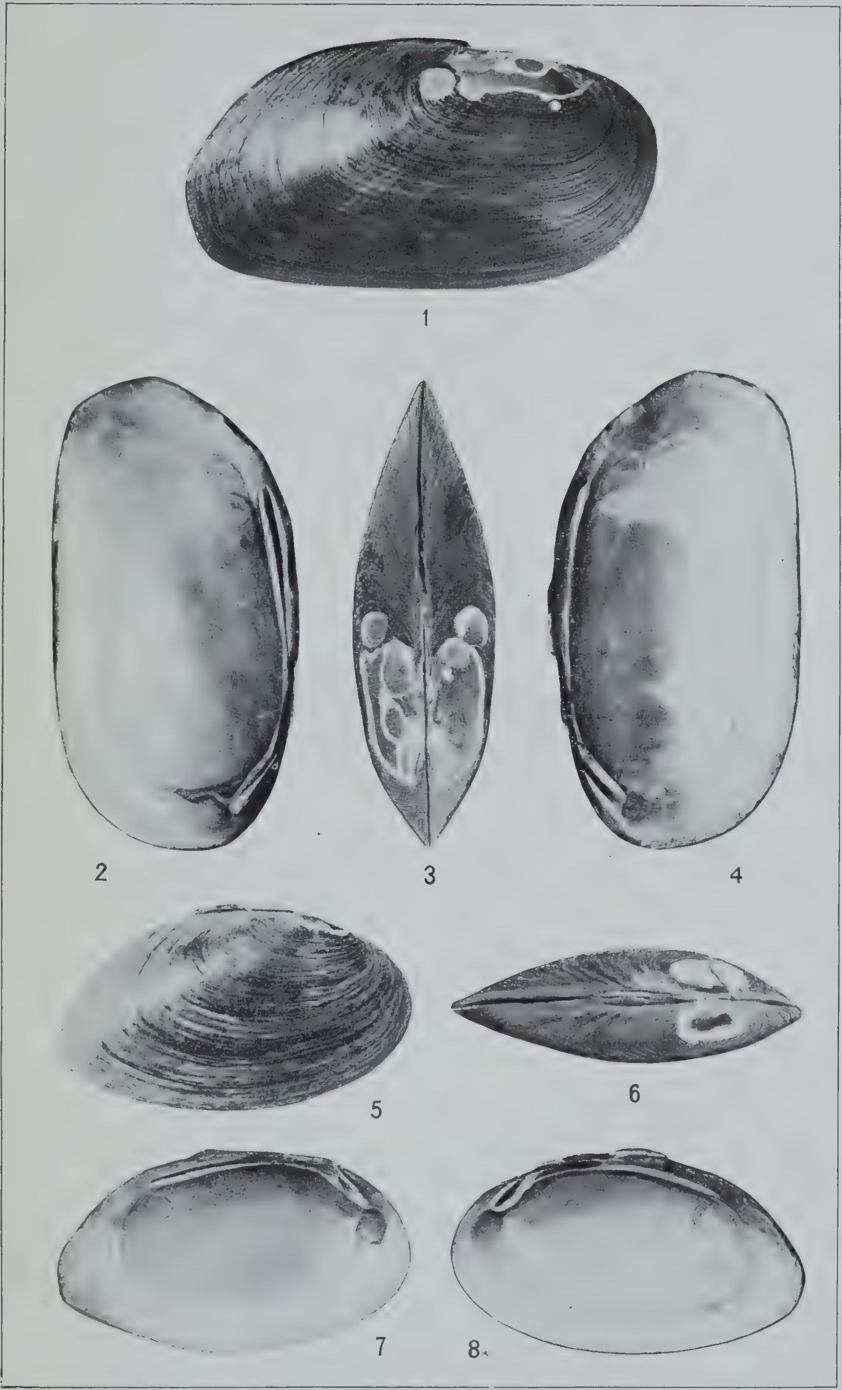
South American Diplodons.

For explanation of plate see page 388.



South American Diplodons.

For explanation of plate see page 388.



South American Diplodons.

For explanation of plate see page 388.

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THREE NEW SPECIES OF ANODONTITES FROM BRAZIL

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BY

WILLIAM B. MARSHALL
Assistant Curator, Division of Marine Invertebrates, United States National Museum

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No. 2122.—From the Proceedings of the United States National Museum,
Vol. 49, pages 527–529, with Plates 67–69

Published December 11, 1915

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Government Printing Office
1915

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THREE NEW SPECIES OF ANODONTITES FROM BRAZIL.

By William B. Marshall,
Assistant Curator, Division of Marine Invertebrates, United States National Museum.

Among some Brazilian naiads recently sent to the United States National Museum for identification by Mr. Dias da Rocha of Ceara, Brazil, were two species of Anodontites which appear to be new. They are from Ceara, Brazil. They are not represented in the Museum collection, nor in the collection of the Academy of Natural Sciences of Philadelphia, which I have examined, with the kind assistance of Dr. H. A. Pilsbry. I have been unable to find them described in the literature relating to the genus and have concluded that they belong to an undescribed species. More recently, Mr. da Rocha has sent four additional valves of Anodontites from the same locality. Two of these belong to typical *Anodontites sinuosus* Lamarck, while the other two belong to a new species.

The following descriptions and figures will serve to define the three species:

ANODONTITES SALMONEA, new species.

Plate 67.

Shell moderately thick, rounded in front, obtusely angular behind, widest just posterior to the beaks. Periostracum thin, with a dull polish, marked by obscure rays which are formed by a ruffling of the periostracum itself. Entire surface of the shell marked by concentric impressed lines, which, in the earlier stages of growth are more regular, stronger, and nearly evenly spaced, but which become faint and irregular as growth progresses. Periostracum light yellowish olive, the rest stages indicated by dark lines, and the color gradually darkens from the beaks to the margins. Posterior ridge rounded, but little elevated. Posterior dorsal area with a low rib running from the beak to a point above the posterior angle. Beaks eroded, salmon pink, and this color shows through the periostracum for some distance from the beaks, showing that the material of the shell itself is of this color. Nacre beautiful salmon pink, the color deepest in the cavity of the beak, and becoming paler and more iridescent toward the margins. Prismatic margin dull greenish, or whitish tinged with green. Surface of the nacre marked by innumerable fine radiating lines which are part of the nacre or of the shell substance.

Hinge line slightly arched and not making a sharp angle with the anterior and posterior margins. Sinulus small but very prominent and almost an equilateral triangle.

The type, Cat. No. 273688, U.S.N.M., is a single valve, probably nearly adult, from Ceara, Brazil, and measures: Length, 66 mm.; breadth, 38 mm.; diameter, if both valves were present, would be 24 mm. There is also a younger specimen, whch measures: Length, 39 mm.; breadth, 22 mm.; diameter, 14 mm.

This species shows no close relationship to any described species. Its nearest relative is *Anodontites wymani* Lea, but the two species differ in form, color of periostracum and nacre, and especially in the color of the prismatic margin. The sinulus of *wymani* is long and narrow, while that of *salmonea* is nearly an equilateral triangle. The hinge plate of *wymani* is short, broad, and heavy; that of *salmonea* is longer, narrower, and lighter.

ANODONTITES DAROCHAI, new species.

Plate 68.

Shell very thin and fragile, somewhat inflated, regularly rounded in front and angulately rounded behind, somewhat constricted just in front of the middle. Widest near the posterior end of the hinge line. Beak eroded, upper portion of each valve with numerous, obscure, evenly spaced, channeled lines. Periostracum thin, smooth, polished, greenish olive, with the rest periods indicated by a brownish line. Posterior ridge evenly rounded. Posterior dorsal area dark green with two darker green rays. Many other green rays over the entire surface which are widest and darkest posteriorly, while anteriorly they are narrow and faint.

Nacre highly iridescent, suffused with a lurid cast, marked by fine radiating lines in the texture of the shell. Channeled concentric lines of the outer surface showing through. Hinge line straight, making abrupt angles with the anterior and posterior margins. Cavity of the beaks and vicinity of the sinulus diseased, and this disease obscures the character of the sinulus.

The type, Cat. No. 273687, U.S.N.M., is a single valve from Ceara, Brazil. It is not yet fully adult. It measures: Length, 75 mm.; breadth, 45 mm.; diameter, if both valves were present, would be 24 mm.

It is named in honor of the donor, Mr. Dias da Rocha.

A young specimen from the same place sent by Mr. da Rocha possibly belongs to this species, but has a bluish nacre and a light greenish periostracum. *Anodontites sinuosus* is the nearest relative of this species. The former is nearly truncate posteriorly, while the latter is somewhat nasute, and the two species differ in other respects, but it is possible that a large series of specimens would show *A. darochai* to be a variety of *A. sinuosus*.

ANODONTITES AURORA, new species.

Plate 69.

Shell elongately subquadrate, regularly rounded in front, angularly rounded, but somewhat attenuated, posteriorly. Early shell with concentric, channeled lines, posterior dorsal area with evenly spaced, concentric, channeled lines which fade out just in front of the posterior ridge. Anteriorly the shell is nearly smooth. Posteriorly there is a succession of low, broad concentric ribs. Color brownish-olive, glossy, darkening anteriorly to light brown; posterior area very dark brown, almost blackish, the dark color here sharply differentiated from the lighter color of the rest of the shell; entire surface more or less marked with radiating brown lines varying in width and intensity; rest periods five, indicated by darker brownish lines.

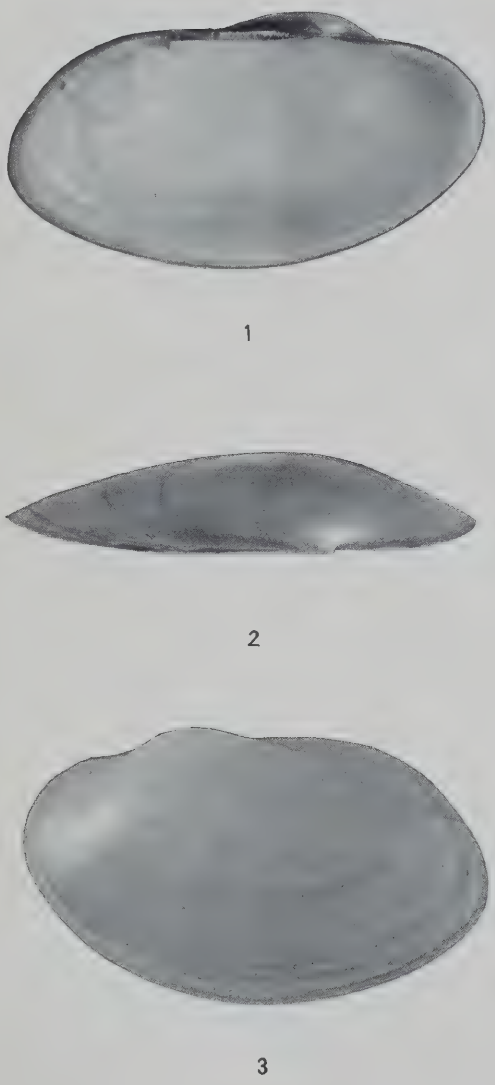
Nacre highly iridescent, with a lurid cast, marked by innumerable radiating straiae, which are in the texture of the shell. Cavity of the beak shallow. Upper portion of nacre, including the hinge line, blotched with lavender. Prismatic margin very narrow, bluish-white. Hinge line nearly straight, making an abrupt angle with the anterior margin of the shell, but scarcely any angle with the posterior margin.

The type, Cat. No. 273689, U.S.N.M., consists of a single valve which measures: Length, 110 mm.; height, 86 mm.; diameter, if both valves were present, would be 34 mm. It and one other valve come from Ceara, Brazil.

Superficially this species seems to be most nearly related to *Anodontites trapezialis* Lamarck, but a careful study of form, nacre, color, and other characters shows a closer relationship to *Anodontites sinuosus* Lamarck. *Anodontites trapezialis* narrows in front to such a degree as to give the shell a generally oblique appearance. The narrowing in *A. aurora* is much less, and hence the shell has a more quadrate form. The difference in the thickness of the two species is very great, *trapezialis* being much the thicker and much heavier. The nacre of *trapezialis* is dull, bluish-white while that of *aurora* is highly iridescent and has a lurid cast. In nacre *A. aurora* agrees in practically all respects with *A. sinuosus*.

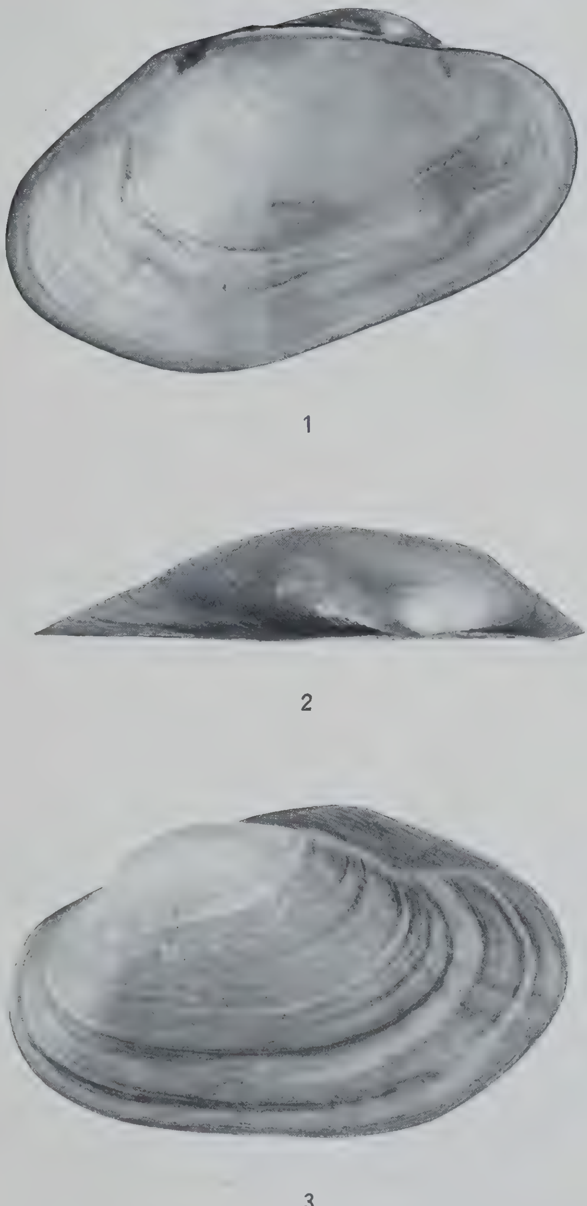
A. sinuosus has a generally pathologic appearance. The nacre is blotched with purplish-brown and the posterior portion of the shell is rudely constructed and looks like a "bad job." *A. aurora* has the purplish blotches on the nacre, but the posterior portion of the shell neatly finished. It is possible that *A. sinuosus* if grown to perfection would possess the elongated form of *A. aurora* and that the latter would then prove to be a variety of the former.

The name *aurora* is appropriate for the species because of the play of brilliant colors in the nacre.



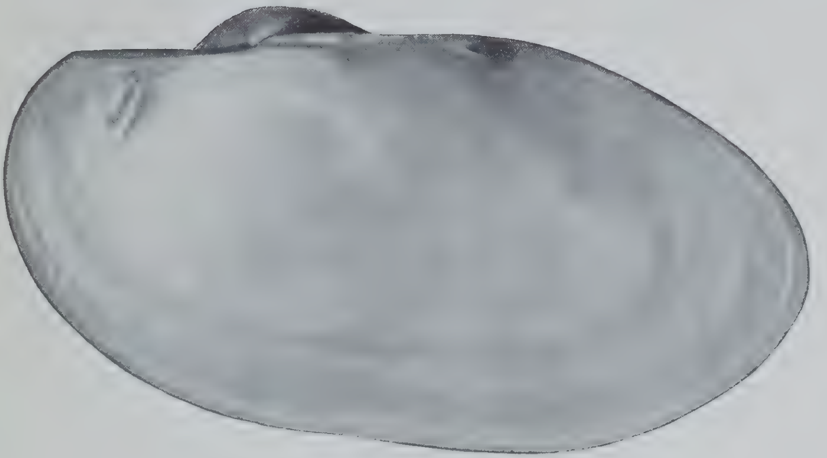
ANODONTITES SALMONEA.

FOR EXPLANATION OF PLATE SEE PAGE 527.



Anodontites darochai.

For explanation of plate see page 528.



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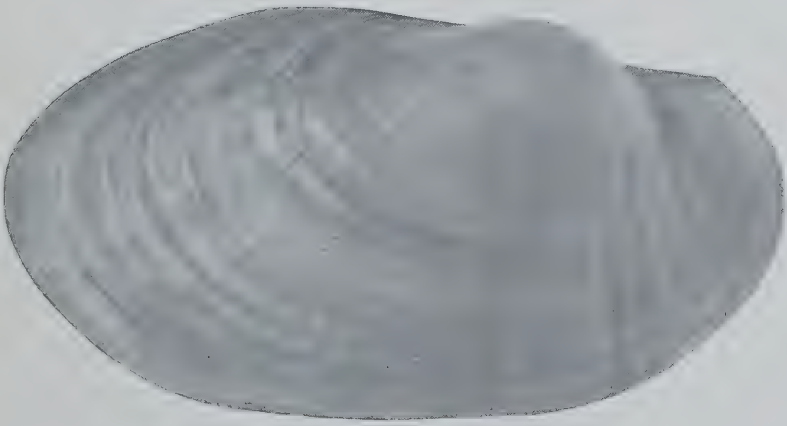

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ANODONTITES AURORA

FOR EXPLANATION OF PLATE SEE PAGE 529.

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  BLvl:  a  Form: Conf:  0          Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1920,
   1  040      EEM ≠ c EEM ≠ d OCL
   2  090      Q11 ≠ b .U55 v.56
   3  092      ≠ b
   4  049      UIUU
   5  100 1   Dall, William Healey, ≠ d 1845-1927.
   6  245 10  Descriptions of new species of Mollusca from the north Pacific
Ocean in the collection of the United States National museum / ≠ c by William
Healey Dall.
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 56
   8  650  0  Mollusks ≠ z Pacific Ocean.
   9  773 0   United States National Museum. ≠ t Proceedings of the United
States National Museum. ≠ d Washington, Smithsonian Institution Press, 1920. ≠ g
24 cm. v. 56, p. 293-371. ≠ x 0096-3801 ≠ w (OCoLC) 1259735
```

Pamphlet 26)

```
  NO HOLDINGS IN UIU - 3 OTHER HOLDINGS
  OCLC:  22104401 Rec stat:    c
  Entered:    19900720  Replaced:    19960419   Used:    19950407
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  a  Form: Conf:  0          Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1894,
   1  040      EEM ≠ c EEM ≠ d OCL
   2  090      Q11 ≠ b .U55 v.16
   3  092      ≠ b
   4  049      UIUU
   5  100 1   Dall, William Healey, ≠ d 1845-1927.
   6  245 10  Land shells of the genus Bulimulus in Lower California, with
descriptions of several new species. ≠ c By William Healey Dall.
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 16
   8  500      Issued November 23, 1893.
   9  650  0  Mollusks ≠ z Baja California.
  10  773 0   United States National Museum. ≠ t Proceedings of the United
States National Museum. ≠ d Washington, Smithsonian Institution Press, 1894. ≠ g
24 cm. v. 16, 1893, p. 639-647. pl. LXXI-LXXII. ≠ x 0096-3801 ≠ w (OCoLC)
1259735
```

Pamphlet 27)

```
  NO HOLDINGS IN UIU - 3 OTHER HOLDINGS
  OCLC:  26639890 Rec stat:    c
  Entered:    19920921  Replaced:    19960920   Used:    19940714
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  a  Form: Conf:  0           Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1919,
   1  040      EEM ≠ c EEM ≠ d OCL
   2  090      Q11 ≠ b .U55 v.54
   3  092      ≠ b
   4  049      UIUU
   5  100 1   Dall, William Healey, ≠ d 1845-1927.
   6  245 10  Notes on the nomenclature of the mollusks of the family
Turritidae / ≠ c by William Healey Dall.
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 54
   8  650  0  Turridae.
   9  650  0  Mollusks ≠ x Nomenclature.
  10  773 0   United States National Museum. ≠ t Proceedings of the United
States National Museum. ≠ d Washington, Smithsonian Institution Press, 1919. ≠ g
24 cm. v. 54, p. 313-333. ≠ x 0096-3801 ≠ w (OCoLC) 1259735
```

Pamphlet 28)

```
  NO HOLDINGS IN UIU - 6 OTHER HOLDINGS
  OCLC:  27241382 Rec stat:    c
  Entered:    19930112  Replaced:    19960920   Used:    [illegible]
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  a  Form: Conf:  0           Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0 .  Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1917,
   1  040      EEM ≠ c EEM ≠ d OCL
   2  090      Q11 ≠ b .U55 v.53
   3  092      ≠ b
   4  049      UIUU
   5  100 1   Dall, William Healey, ≠ d 1845-1927.
   6  245 10  Notes on the shells of the genus Epitonium and its allies of the
Pacific coast of America / ≠ c by William Healey Dall.
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 53
   8  650  0  Epitonium.
   9  773 0   United States National Museum. ≠ t Proceedings of the United
States National Museum. ≠ d Washington, Smithsonian Institution Press, 1917. ≠ g
24 cm. v. 53, p. 471-488. ≠ x 0096-3801 ≠ w (OCoLC) 1259735
```

Pamphlet 29)

```
  NO HOLDINGS IN UIU - 3 OTHER HOLDINGS
  OCLC:  26491817 Rec stat:    c
  Entered:    19920827  Replaced:    19960920   Used:    19970515
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  a  Form: Conf:  0           Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1916,
   1  040      EEM ≠ c EEM ≠ d OCL
   2  090      Q11 ≠ b .U55 v.49
   3  092      ≠ b
   4  049      UIUU
   5  100 1   Dall, William Healey, ≠ d 1845-1927.
   6  245 10  Notes on the species of the molluscan subgenus Nucella
inhabiting the northwest coast of America and adjacent regions / ≠ c by William
Healey Dall.
```

```
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 49
   8  650  0  Nucella.
   9  650  0  Mollusks ≠ z Pacific Coast.
  10  773 0   United States National Museum. ≠ t Proceedings of the United
States National Museum. ≠ d Washington, Smithsonian Institution Press, 1916. ≠ g
24 cm. v. 49, p. 557-572. pl. 74-75. ≠ x 0096-3801 ≠ w (OCoLC) 1259735
```

Pamphlet 30)

```
  NO HOLDINGS IN UIU - 3 OTHER HOLDINGS
  OCLC:  26491810 Rec stat:    c
  Entered:    19920827  Replaced:    19960920   Used:    19970515
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  a  Form: Conf:  0          Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1916,
   1  040      EEM ≠ c EEM ≠ d OCL
   2  090      Q11 ≠ b .U55 v.49
   3  092      ≠ b
   4  049      UIUU
   5  100 1   Dall, William Healey, ≠ d 1845-1927.
   6  245 12  A review of some bivalve shells of the group Anatinacea from the west
coast of America / ≠ c by William Healey Dall.
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 49
   8  650  0  Anatinacea.
   9  650  0  Mollusks ≠ z Pacific Coast.
  10  773 0   United States National Museum. ≠ t Proceedings of the United
States National Museum. ≠ d Washington, Smithsonian Institution Press, 1916. ≠ g
24 cm. v. 49, p. 441-456. ≠ x 0096-3801 ≠ w (OCoLC) 1259735
```

Pamphlet 31)

```
  NO HOLDINGS IN UIU - 7 OTHER HOLDINGS
  OCLC:  26510765 Rec stat:    c
  Entered:    19920831  Replaced:    19960920   Used:    19950518
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  a  Form: Conf:  0          Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1917,
   1  040      EEM ≠ c EEM ≠ d OCL
   2  090      Q11 ≠ b .U55 v.51
   3  092      ≠ b
   4  049      UIUU
   5  100 1   Dall, William Healey, ≠ d 1845-1927.
   6  245 10  Summary of the mollusks of the family Alectrionidae of the west
coast of America / ≠ c by William Healey Dall.
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 51
   8  650  0  Alectrionidae.
   9  650  0  Mollusks ≠ z Pacific Coast.
  10  773 0   United States National Museum. ≠ t Proceedings of the United
States National Museum. ≠ d Washington, Smithsonian Institution Press, 1917. ≠ g
24 cm. v. 51, p. 575-579. ≠ x 0096-3801 ≠ w (OCoLC) 1259735
```

Pamphlet 32)

```
  NO HOLDINGS IN UIU - 3 OTHER HOLDINGS
  OCLC:  25830962 Rec stat:    n
  Entered:    19920516  Replaced:    19920516   Used:    19960426
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  a  Form: Conf:  0          Biog: MRec: Ctry:  dcu
```

```
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1908,
   1  040      EEM ≠ c EEM
   2  090      Q11 ≠ b .U55 v.33
   3  092      ≠ b
   4  049      UIUU
   5  100 1   Dall, William Healey, ≠ d 1845-1927.
   6  245 10  Supplementary notes on Martyn's Universal conchologist / ≠ c by
William Healey Dall.
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 33
   8  500     Issued October 23, 1907.
   9  600 11  Martyn, Thomas, ≠ d 1735-1825 ≠ t The universal conchologist.
  10  773 0   United States National Museum. ≠ t Proceedings of the United
States National Museum. ≠ d Washington, 1908. ≠ g 24 cm. v. 33, p. 185-192 ≠ x
0096-3801 ≠ w (OCoLC) 1259735
```

Pamphlet 33)

```
  NO HOLDINGS IN UIU - 1 OTHER HOLDING
  OCLC:  24384609 Rec stat:    c
  Entered:    19910916  Replaced:    19960919   Used:    19910916
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  a  Form: Conf:  0            Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1903,
   1  040      EEM ≠ c EEM ≠ d OCL
   2  090      Q11 ≠ b .U55 v.26
   3  092      ≠ b
   4  049      UIUU
   5  100 1   Dall, William Healey, ≠ d 1845-1927.
   6  245 10  Synopsis of the family Astartidae, with a review of the American
species, ≠ c by William Healey Dall.
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 26
   8  500     Issued July 10, 1903.
   9  650  0  Mollusks, Fossil.
  10  773 0   United States National Museum. ≠ t Proceedings of the United
States National Museum, v. 26. ≠ d Washington, 1903. ≠ g 24 cm. p. 933-951. pl.
LXII-LXIII ≠ x 0096-3801 ≠ w (OCoLC) 1259735
```

Pamphlet 34)

```
  NO HOLDINGS IN UIU - 1 OTHER HOLDING
  OCLC:  24346896 Rec stat:    c
  Entered:    19910909  Replaced:    19960919   Used:    19910909
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  a  Form: Conf:  0            Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1901,
   1  040      EEM ≠ c EEM ≠ d OCL
   2  090      Q11 ≠ b .U55 v.23
   3  092      ≠ b
   4  049      UIUU
   5  100 1   Dall, William Healey, ≠ d 1845-1927.
   6  245 10  Synopsis of the family Cardiidae and of the North American
species, ≠ c by William Healey Dall ...
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 23
   8  500     Issued January 2, 1901.
   9  650  0  Mollusks ≠ z North America.
  10  773 0   United States National Museum.   t Proceedings of the United
```

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States National Museum, v. 23. ≠ d Washington, 1901. ≠ g 24 cm. p. 381-392 ≠ x
0096-3801 ≠ w (OCoLC) 1259735
```

Pamphlet 35)

```
  NO HOLDINGS IN UIU - 2 OTHER HOLDINGS
  OCLC: 24346983 Rec stat:    c
  Entered:    19910909  Replaced:    19960919   Used:    19960419
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  a  Form: Conf:  0          Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1900,
   1  040      EEM ≠ c EEM ≠ d OCL
   2  090      Q11 ≠ b .U55 v.22
   3  092      ≠ b
   4  049      UIUU
   5  100 1    Dall, William Healey, ≠ d 1845-1927.
   6  245 10   Synopsis of the Solenidae of North America and the Antilles, ≠ c
by William H. Dall ...
   7  410 20   United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 22
   8  500      Issued October 9, 1899.
   9  650  0   Mollusks, Fossil.
  10  650  0   Paleontology ≠ z North America.
  11  773 0    United States National Museum. ≠ t Proceedings of the United
States National Museum, v. 22. ≠ d Washington, 1900. ≠ g 24 cm. p. 107-112 ≠ x
0096-3801 ≠ w (OCoLC) 1259735
```

Pamphlet 36)

```
  NO HOLDINGS IN UIU - 7 OTHER HOLDINGS
  OCLC: 18756165 Rec stat:    n
  Entered:    19881112  Replaced:    19950502   Used:    19960404
 Type:  a   ELvl:  I    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  m  Form: Conf:  0          Biog: MRec: Ctry:  dcu
  Cont:  b  GPub:  f    Fict:  0    Indx:  1
  Desc:  a  Ills:  af    Fest:  0   DtSt:  s    Dates: 1902,
   1  040      SMI ≠ c SMI
   2  090      QL430.7.V5 ≠ b D14 1902
   3  092      ≠ b
   4  049      UIUU
   5  100 1    Dall, William Healey, ≠ d 1845-1927.
   6  245 10   Synopsis of the family Veneridae and of the North American recent
species / ≠ c by William Healey Dall.
   7  260      Washington : ≠ b G.P.O., ≠ c 1902.
   8  300      p. 335-412, [5] leaves of plates : ≠ b ill. ; ≠ c 26 cm.
   9  500      "From the Proceedings of the United States National Museum, v.
XXVI, no. 1312."
  10  504      Bibliography: p. 338-345.
  11  500      Includes index.
  12  650  0   Veneridae.
  13  710 2    United States National Museum.
  14  730 0    Proceedings of the United States National Museum.
```

Pamphlet 37)

```
  NO HOLDINGS IN UIU - 3 OTHER HOLDINGS
  OCLC: 24346954 Rec stat:    c
  Entered:    19910909  Replaced:    19960925   Used:    19920807
 Type:  a   ELvl:  I    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  a  Form: Conf:  0          Biog: MRec: Ctry:  dcu
  Cont:  b  GPub:  f    Fict:  0    Indx:  0
  Desc:  i  Ills:  af    Fest:  0   DtSt:  r    Dates: 1901,1901
```

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   1  040     EEM ≠ c EEM ≠ d SMI ≠ d OCL
   2  043     n-------
   3  090     Q11 ≠ b .U55 v.23
   4  092     ≠ b
   5  049     UIUU
   6  100 1   Dall, William Healey, ≠ d 1845-1927.
   7  245 10  Synopsis of the Lucinacea and of the American species / ≠ c by
William Healey Dall.
   8  260     Washington : ≠ b G.P.O., ≠ c 1901.
   9  300     p. 779-833, xxxix-xlii leaves of plates : ≠ b ill. ; ≠ c 25 cm.
  10  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 23
  11  500     Issued August 22, 1901.
  12  500     At head of title: Smithsonian Institution. United States
National Museum.
  13  504     Includes bibliographical references (p. 781-784).
  14  650  0  Mollusks.
  15  650  0  Bivalvia.
  16  710 2   United States National Museum.
  17  773 0   United States National Museum. ≠ t Proceedings of the United
States National Museum, v. 23. ≠ d Washington, 1901. ≠ g 24 cm. p. 779-833. pl.
XXXIX-XLII ≠ x 0096-3801 ≠ w (OCoLC) 1259735
```

Pamphlet 38)

```
  NO HOLDINGS IN UIU - 2 OTHER HOLDINGS
  OCLC:  25633472 Rec stat:    n
  Entered:    19920411  Replaced:    19920411   Used:    19930723
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  a  Form: Conf:  0          Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1906,
   1  040     EEM ≠ c EEM
   2  090     Q11 ≠ b .U55 v.29
   3  092     ≠ b
   4  049     UIUU
   5  100 1   Dall, William Healey, ≠ d 1845-1927.
   6  245 10  Thomas Martyn and the Universal conchologist / ≠ c by William
Healey Dall.
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 29
   8  500     Issued October 6, 1905.
   9  600 11  Martyn, Thomas, ≠ d 1735-1825 ≠ t Universal conchologist.
  10  773 0   United States National Museum. ≠ t Proceedings of the United
States National Museum. ≠ d Washington, 1906. ≠ g 24 cm. v. 29, p. 415-432 ≠ x
0096-3801 ≠ w (OCoLC) 1259735
```

Pamphlet 39)

```
  NO HOLDINGS IN UIU - 2 OTHER HOLDINGS
  OCLC:  18316283 Rec stat:    c
  Entered:    19880805  Replaced:    19950426   Used:    19930924
 Type:  a   ELvl:  I    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  m  Form: Conf:  0          Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:  a  Ills: Fest:  0    DtSt:  s    Dates: 1906,
   1  040     SMI ≠ c SMI
   2  043     a-ja--- ≠ a n-us---
   3  090     QL402 ≠ b .D14n 1906
   4  092     ≠ b
   5  049     UIUU
   6  100 1   Dall, William Healey, ≠ d 1845-1927.
```

```
   7  245 10  Notes on Japanese, Indopacific and American Pyramidellidae / ≠ c
by William Healey Dall and Paul Bartsch.
   8  260      Washington, D.C. : ≠ b U.S. Govt. Print. Off, ≠ c 1906.
   9  300      p. 321-369. ≠ b plates 17-26, ≠ c 25 cm.
  10  500      Reprinted from Proceedings of the United States National Museum,
v.30.- No. 1452.
  11  650  0  Pyramidellidae ≠ z Japan.

  12  650  0  Pyramidellidae ≠ z United States.
  13  650  0  Gastgeropoda.
  14  700 1   Bartsch, Paul, ≠ d 1871-1960.
  15  730 0   Proceedings of the United States National Museum.
```

Pamphlet 40)

```
  NO HOLDINGS IN UIU - 4 OTHER HOLDINGS
  OCLC:  25772580 Rec stat:    n
  Entered:    19920506  Replaced:    19950527   Used:    19960426
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  a  Form: Conf:  0           Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1908,
   1  040      EEM ≠ c EEM
   2  090      Q11 ≠ b .U55 v.33
   3  092      ≠ b
   4  049      UIUU
   5  100 1   Dall, William Healey, ≠ d 1845-1927.
   6  245 14  The pyramidellid mollusks of the Oregonian faunal area / ≠ c by
William Healey Dall and Paul Bartsch.
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 33
   8  500      Issued December 31, 1907.
   9  650  0  Mollusks ≠ z Oregon.
  10  700 1   Bartsch, Paul, ≠ d 1871-1960.
  11  773 0   United States National Museum. ≠ t Proceedings of the United
States National Museum. ≠ d Washington, 1908. ≠ g 24 cm. v. 33, p. 491-534 ≠ x
0096-3801 ≠ w (OCoLC) 1259735
```

Pamphlet 41)

```
  NO HOLDINGS IN UIU - 4 OTHER HOLDINGS
  OCLC:  17282926 Rec stat:    n
  Entered:    19871223  Replaced:    19871223   Used:    19950104
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  a  Form: Conf:  0           Biog: MRec: Ctry:  inu
  Cont:  i  GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1904,
   1  040      EEM ≠ c EEM
   2  090      QL415.I5 ≠ b D3
   3  092      ≠ b
   4  049      UIUU
   5  100 1   Daniels, L. E.
   6  245 12  A check list of Indiana Mollusca, ≠ b with localities. ≠ c By L.E.
Daniels.
   7  500      Index to Molluska of Indiana: 1902 report, p. 678-680.
   8  650  0  Mollusks ≠ z Indiana.
   9  773 0   Indiana. Dept. of Geology and Natural Resources. ≠ t Annual
report. ≠ d Indianapolis, 1904. ≠ g 23 cm. p. 629-652 ≠ w (OCoLC)7536715
```

Pamphlet 42)
no OCLC

```
  Davis, C. Abbott
```

```
     Notes on the mollusca of the Bermuda Islands / by C. Abbott Davis.
  [S.l. : s.n. , 19--?].
     p. 1-6 ; 23 cm.
     Reprinted from the "Nautilus"-- date unknown.
```

Pamphlet 43)

```
  NO HOLDINGS IN UIU - 5 OTHER HOLDINGS
  OCLC:  26408599 Rec stat:    c
  Entered:    19920817  Replaced:    19960920   Used:    19950522
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c      Lang:  eng
  BLvl:  a  Form: Conf:  0          Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1915,
   1  040      EEM ≠ c EEM ≠ d OCL
   2  090      Q11 ≠ b .U55 v.47
   3  092      ≠ b
   4  049      UIUU
   5  100 1   Frierson, L. S.
   6  245 12  A new pearly freshwater mussel of the genus Hyria from Brazil /
≠ c by L. S. Frierson.
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 47
   8  650  0  Freshwater mussels ≠ z Brazil.
   9  773 0   United States National Museum. ≠ t Proceedings of the United
States National Museum. ≠ d Washington, Smithsonian Institution Press, 1915. ≠ g
24 cm. v. 47, p. 363. pl. 12. ≠ x 0096-3801 ≠ w (OCoLC) 1259735
```

Pamphlet 44)

```
  NO HOLDINGS IN UIU - 6 OTHER HOLDINGS
  OCLC:  26443070 Rec stat:    c
  Entered:    19920819  Replaced:    19960920   Used:    19950531
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c      Lang:  eng
  BLvl:  a  Form: Conf:  0          Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1915,
   1  040      EEM ≠ c EEM ≠ d OCL
   2  090      Q11 ≠ b .U55 v.48
   3  092      ≠ b
   4  049      UIUU
   5  100 1   Henderson, John Brooks, ≠ d 1870-1923.
   6  245 10  Rediscovery of Pourtales' Haliotis / ≠ c by John B. Henderson.
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 48
   8  650  0  Abalones.
   9  773 0   United States National Museum. ≠ t Proceedings of the United
States National Museum. ≠ d Washington, Smithsonian Institution Press, 1915. ≠ g
24 cm. v. 48, p. 659-661. pl. 45-46. ≠ x 0096-3801 ≠ w (OCoLC) 1259735
```

Pamphlet 45)

```
  NO HOLDINGS IN UIU - 5 OTHER HOLDINGS
  OCLC:  26433071 Rec stat:    c
  Entered:    19920818  Replaced:    19960920   Used:    19950522
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c      Lang:  eng
  BLvl:  a  Form: Conf:  0          Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1915,
   1  040      EEM ≠ c EEM ≠ d OCL
   2  090      Q11 ≠ b .U55 v.47
   3  092      ≠ b
   4  049      UIUU
```

```
   5  100 1   Henderson, John Brooks, ≠ d 1870-1923.
   6  245 10  Littoral marine mollusks of Chincoteague Island, Virginia / ≠ c
by John b. Henderson and Paul Bartsch.
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 47
   8  650  0  Mollusks ≠ z Virginia.
   9  700 1   Bartsch, Paul, ≠ d 1871-1960.
  10  773 0   United States National Museum. ≠ t Proceedings of the United
States National Museum. ≠ d Washington, Smithsonian Institution Press, 1915. ≠ g
24 cm. v. 47, p. 411-421. pl. 13-14. ≠ x 0096-3801 ≠ w (OCoLC) 1259735
```

Pamphlet 46)

```
  NO HOLDINGS IN UIU - 2 OTHER HOLDINGS
  OCLC:  20859074 Rec stat:    c
  Entered:     19900108  Replaced:     19900108   Used:     19950717
 Type:  a    ELvl:  I     Srce:  d     Audn: Ctrl: c      Lang:  eng
  BLvl:  m   Form: Conf:  0            Biog: MRec: Ctry:  cou
  Cont:      GPub: Fict:  0     Indx:  0
  Desc:  a   Ills:  af    Fest:  0   DtSt:  r     Dates: 1907,1907
   1  040       SMI ≠ c SMI
   2  090       QL415.C6 ≠ b H496 1907
   3  092       ≠ b
   4  049       UIUU
   5  100 1     Henderson, Junius, ≠ d 1865-1937.
   6  245 14    The mollusca of Colorado. ≠ n Part I / ≠ c by Junius Henderson.
   7  260       [Boulder : ≠ b University of Colorado, ≠ c 1907?]
   8  300       p. 77-96, 2 leaves of plates : ≠ b ill. ; ≠ c 26 cm.
   9  500       Caption title.
  10  500       "Reprinted from University of Colorado studies, vol. IV, no. 2,
Boulder, Colo., February 1907."
  11  504       Includes bibliographical references.
  12  650  0    Mollusks ≠ z Colorado.
```

Pamphlet 47)

```
  NO HOLDINGS IN UIU - 4 OTHER HOLDINGS
  OCLC:  26381089 Rec stat:    c
  Entered:     19920812  Replaced:     19960920   Used:     19950118
 Type:  a    ELvl:  K     Srce:  d     Audn: Ctrl: c      Lang:  eng
  BLvl:  a   Form: Conf:  0            Biog: MRec: Ctry:  dcu
  Cont:  b   GPub: Fict:  0     Indx:  0
  Desc:      Ills: Fest:  0     DtSt:  s     Dates: 1914,
   1  040       EEM ≠ c EEM ≠ d OCL
   2  090       Q11 ≠ b .U55 v.46
   3  092       ≠ b
   4  049       UIUU
   5  100 1     Kirk, Edwin, ≠ d 1884-
   6  245 10    Notes on the fossil crinoid genus Homocrinus Hall / ≠ c by Edwin
Kirk.
   7  410 20    United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 46
   8  504       Bibliography: p. 483.
   9  650  0    Homocrinus.
```

Pamphlet 48)
no oclc

```
  Kobelt, Wilhelm, ≠ d 1840-1916.
      Exkursionen in Nordafrika / W. Kobelt.
  [Frankfurt a.M., ≠ b s.n., ≠ c 1886]
      p. 1-32, 49-64 ; 23 cm.  (Nachrichtsblatt der Deutschen Malakozoologischen
  Gesellschaft.  v.18, no. 1-2.)
```

"Januar-Februar 1886".

Pamphlet 49)

```
  NO HOLDINGS IN UIU - 6 OTHER HOLDINGS
  OCLC: 26816431 Rec stat:    c
  Entered:    19921019  Replaced:    19960920   Used:    19970516
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  a  Form: Conf:  0          Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1917,
   1  040      EEM ≠ c EEM ≠ d OCL
   2  090      Q11 ≠ b .U55 v.53
   3  092      ≠ b
   4  049      UIUU
   5  100 1    Marshall, William Bloanchard, ≠ d 1865-
   6  245 10  New and little-known species of South American freshwater
mussels of the genus Diplodon / ≠ c by William b. Marshall.
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 53
   8  650  0  Diplodon.
   9  650  0  Freshwater mussels.
```

Pamphlet 50)

```
  NO HOLDINGS IN UIU - 4 OTHER HOLDINGS
  OCLC: 26497601 Rec stat:    c
  Entered:    19920828  Replaced:    19960920   Used:    19970515
 Type:  a   ELvl:  K    Srce:  d    Audn: Ctrl: c     Lang:  eng
  BLvl:  a  Form: Conf:  0          Biog: MRec: Ctry:  dcu
  Cont:     GPub: Fict:  0    Indx:  0
  Desc:     Ills: Fest:  0    DtSt:  s    Dates: 1916,
   1  040      EEM ≠ c EEM ≠ d OCL
   2  090      Q11 ≠ b .U55 v.49
   3  092      ≠ b
   4  049      UIUU
   5  100 1    Marshall, William Blanchard, ≠ d 1865-
   6  245 10  Three new species of Anodontites from Brazil / ≠ c by William
Blanchard Marshall.
   7  410 20  United States National Museum. ≠ t Proceedings of the United
States National Museum ; ≠ v v. 49
   8  650  0  Anodonites.
   9  773 0   United States National Museum. ≠ t Proceedings of the United
States National Museum. ≠ d Washington, Smithsonian Institution Press, 1916. ≠ g
24 cm. v. 49, p. 527-529. pl. 67-69. ≠ x 0096-3801 ≠ w (OCoLC) 1259735
```